The similarity, in both spectrum and structure, between this source and the Cygnus Loop[9] suggests that it is also an expanding supernova remnant. Optical observations are, however, limited by severe obscuration.

If the source is supposed to lie at a distance between 2 and 20 kpc, then the minimum volume emissivity of the shell at 178 Mc/s is in the range $7{\cdot}5\times10^{12}$–$7{\cdot}5\times10^{13}$ watts $(c/s)^{-1}$ pc^{-3} $ster^{-1}$—a figure some 10^4 times that occurring in the galactic plane. Burbidge and Burbidge[10] in discussing the Cygnus Loop and IC 443 have suggested that the radio emission is due to the ambient flux of high energy electrons moving in an enhanced magnetic field caused by the compression of the interstellar medium by the supernova explosion. The present observations could only be explained in this way if magnetic fields of the order of 5×10^{-3} gauss could be maintained. It therefore seems more probable that an enhancement of the flux of fast electrons must also occur.

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A Note on the Evolution of Close Binary Systems

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In two recent papers, Kopal[1] has analysed and discussed the observational data pertaining to double and single line spectroscopic binaries which happen to be eclipsing variables. He divides the systems into three groups: I. Main sequence detached systems, in which both components lie on the main sequence; II. Semidetached systems, in which the primary component is a main sequence star, while the secondary shows subgiant characteristics; the latter is invariably at its Roche limit; III. Contact systems, in which both components lie on the main sequence, but fill the respective branches of their Roche limit. The potentials on the surfaces of the two components are nearly equal in groups I and III. On the other hand, the secondaries of group II have abnormally low potentials, which fact is attributed to the nonequilibrium processes in the course of their evolution.

According to the current ideas about stellar evolution, a star leaves the main sequence when the hydrogen in the core is exhausted through nuclear reactions. The consequent change in the structure of the star leads to the expansion of the outer layers and takes the star from the main sequence to

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the giant stage. The expanded states of the secondaries in group II may be due to this cause. But since the evolution proceeds faster for the stars of greater mass, we expect the main sequence primaries to reach the giant stage first. Crawford[2] tried to avoid this difficulty by suggesting that the subgiant secondary was originally the more massive star. It evolved faster than its companion and expanded up to its Roche limit, when it lost some of its mass to the less massive star through the first Lagrangian point. The latter became the more massive star eventually. Kopal has raised a valid objection to this hypothesis where he argues that the transfer of large amounts of mass from one component to the other, which is necessary, is not possible from energetic considerations. He has also suggested an alternate hypothesis, according to which the main sequence primary has always been the more massive star. On exhausting the hydrogen in the core it expanded, lost an outer fringe of its envelope to the secondary, and then contracted to its present stage. The mass acquired by the secondary is responsible for its subgiant characteristics. In order to satisfy the statistics of such systems, both hypotheses require that the stages of expansion and contraction of the more massive star should last for astronomically short times only; this condition may not be too improbable.

Kopal has given arguments in support of his hypothesis, in addition to its having no theoretical difficulties such as one would encounter in making a less massive and coeval star evolve faster. Furthermore, a case, *viz.* that of β Lyr, and also perhaps VV Cep, is cited, where we observe the more massive primary in the expanded state filling its lobe of the common equipotential surface. The purpose of this note is to suggest that HD 47129, Plaskett's star, might be another system in which we observe the more massive star in the expanded state.

All available data for HD 47129 are collected in an earlier paper by the author.[3] Most of the evidence indicates that it is the secondary which is not in equilibrium, as the changes in its radial velocity curve and line intensities would suggest. Struve, Sahade and Huang[4] have found evidence for gas streaming from the γ secondary to the primary, and the relatively negative value of the velocity for the secondary is interpreted by Sahade[5] as the expansion of the atmosphere of that component. Now, if the smaller value of its velocity amplitude is actually due to its larger mass, one should expect it to evolve away from the main sequence before its companion. It is very likely that we are observing the secondary in this stage of its evolution. According to Struve, Sahade and Huang[4] the secondary might be a red star, at least redder than its companion, with a large radius; this is to be expected if the star is evolving away from the main sequence and is on the way to being a giant. Assigning a larger mass to the secondary would also reduce the excessively large masses of both components.

There is one apparent flaw in the proposed picture, which relates to the relative brightness of the less massive primary component. Evolutionary tracks have been traced by means of numerical computations for stars of about one solar mass; they indicate that the star brightens as it leaves the main sequence, which means that the track has a positive slope in the HR diagram. This is perhaps also true for stars of somewhat larger mass, such as F and A stars. For still more massive B stars, it is often assumed, as a working hypothesis, that the evolutionary tracks for them run horizontally in the HR diagram. In the absence of numerical results, there is no way to tell how far this is true. By the same token, it cannot be said *a priori*, that the evolutionary tracks of the most massive O stars may not have negative slope in the HR diagram. If, then, we assume that the slope of the evolutionary tracks for them is negative, the faintness of the secondary component of HD 47129 would no longer remain a dilemma. Thus the secondary might have been an O7 star, slightly brighter than its companion, when it was on the main sequence. As it evolved away from the main sequence, it became redder and perhaps fainter. According to Struve, Sahade and Huang[4] the two components may have the same visual magnitude at the present time.

In conclusion, it is interesting to note that HD 47129 is among the four members of Struve's[6] group I of the spectroscopic binaries of early type, the other three members being AO Cas, 29 UW CMa, and V 448 Cyg. One of their common properties is that K_2 is less than K_1. The faintness of their probably more massive secondaries could be accounted for in the same way as in the case of HD 47129, since all of them have spectral type O.

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The Double-Lined Binary Alpha Octantis

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In a programme to determine radial velocities for some southern stars in the FK3 and N30 position catalogues, we have included HD 199532 (α Oct), as its velocity was found to vary by the Lick observers on the Mills expedition to Santiago, Chile.[1] To supplement their published measures of eight spectrograms we have secured 24 more of a similar dispersion (36 A/mm at Hγ) with the three-prism spectrograph at the Cassegrain focus of the 30-inch reflector. The average exposure time for a 5th magnitude star on Eastman Kodak 103a–O emulsion is 30 minutes. Other details of procedure in observing and measurement have been reported elsewhere.[2, 3]

The two sets of measurements show that the period of the velocity variation is 9·073 days. The individual measurements with exact dates will be published later, but are presented in summary form in Fig. 1. On six of the Cassegrain spectrograms double absorption lines are resolved. The measures indicate velocity curves of equal amplitude.

In addition, three plates have been measured which were secured with the two-prism spectrograph at the Newtonian focus of the 74-inch reflector, with a dispersion of 90 A/mm at Hγ. As the excellent quality of the optical components produces images of better spectral resolution, both components could be measured on two of the plates. The internal probable error of the mean velocity for 15 to 18 lines on a single spectrum of α Oct, photographed with either instrument, is about 2·0 km/sec.