A MASS-ECCENTRICITY CORRELATION IN SPECTROSCOPIC AND VISUAL BINARY ORBITS

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Looking for a possible explanation for the debated existence of a correlation between period and eccentricity in binary orbits (of which a diagramme is given in fig. 1.) we made the assumption that the orbital evolution of the binaries could be the consequence of a substantial mass-loss of their components even when these components are late type main sequence stars.

This led first to the consideration of various classes of the areal constant. But it immediately appeared much better to consider for each of such classes, the total mass of each system instead of its orbital eccentricity and thus to consider the mass-period diagramme rather than the period-eccentricity diagramme. Eleven such diagrammes were considered. Figure 2.- gives only the five most typical ones established already in 1963 on the basis of some 212 visual and 98 spectroscopic selected binaries.

One can easily recognize on each diagramme, the existence of an upper limit to the masses of the binaries as a function of the period. It is important to mention that this limit is not due to any selection effects : binaries above this limit should have been discovered and observed more easily than those situated below and would have led to an orbit generally under better conditions.

In order to assure a better definition of this limit, all diagrammes have been piled up after an appropriate shift in abscissae. The final diagramme is given by figure 3.-, where :

$$X = \log P - 3 \log C,$$

C being the areal constant.

The first two diagrammes are the ones obtained with the 1963 material. The other two have been obtained recently on the basis of some 550 visual pairs. No change is observed !

Z. Kopal and J. Rahe (eds.), Binary and Multiple Stars as Tracers of Stellar Evolution, 119–122.

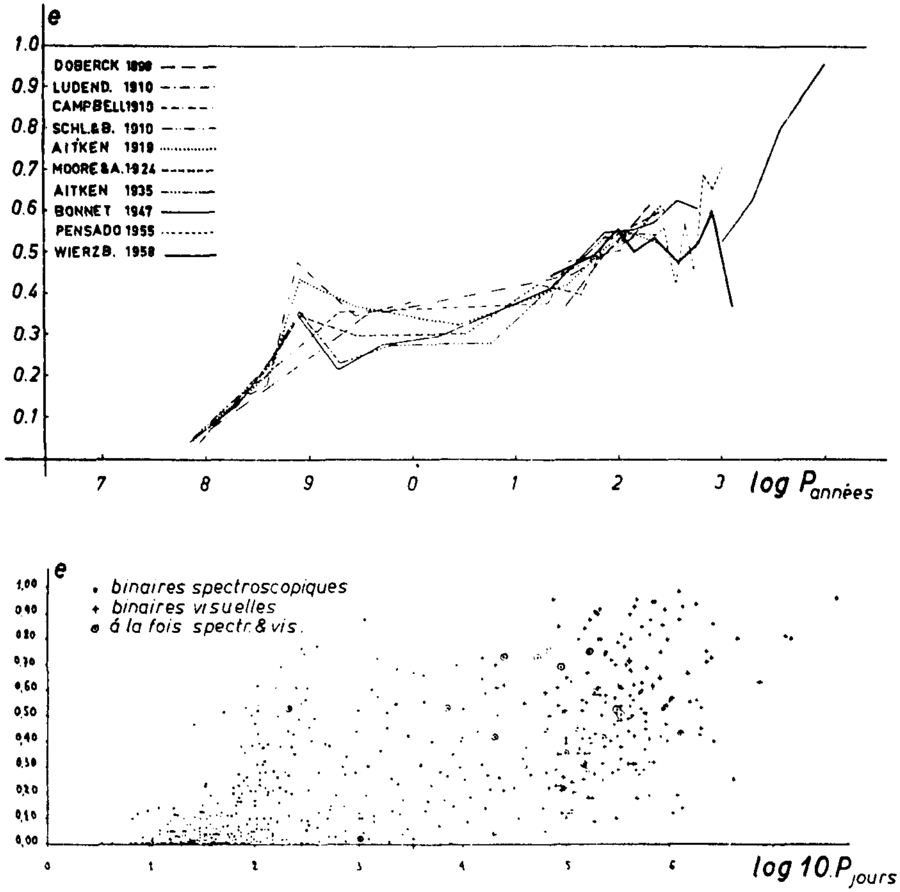

Fig.1.- Period-eccentricity correlation.- Representative curves proposed by various authors (above) and statistical material considered by R. Bonnet (below) - J. Dommanget, 1963.

The upper limit is well represented by the equation :

$$e^{2,8}\,\mathfrak{M}_{AB} = 3,60$$

Any theory on binary formation and evolution should be able to explain this limit.

Details on this research will be found in a paper given (J. Dommanget, 1981) at a recent I.A.U. Colloquium (n° 59) held at Trieste in septembre last year.

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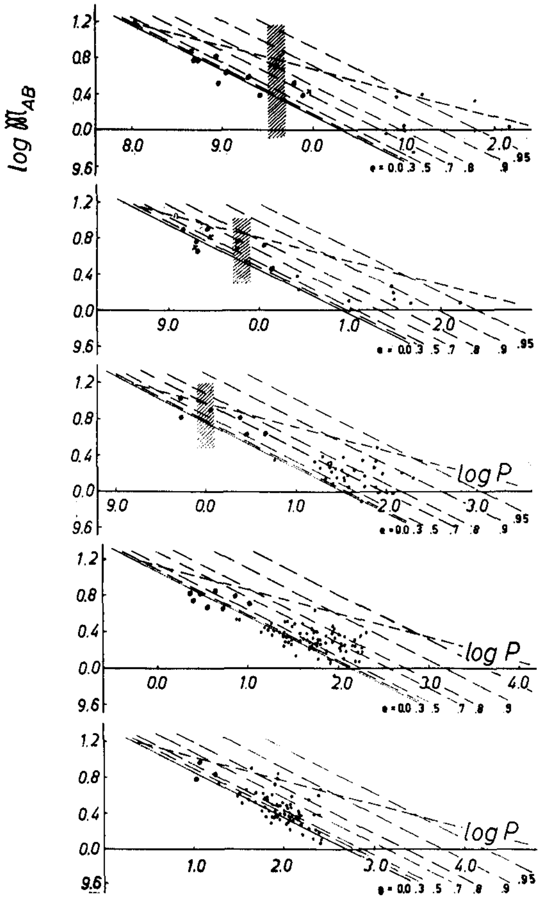

Fig.2.- The five most typical of the eleven diagrammes (log P, log $\mathfrak{M}_{AB}$) established by the author in 1963 and showing on each of them, the existence of an upper limit to the masses of the binaries as a function of the period.

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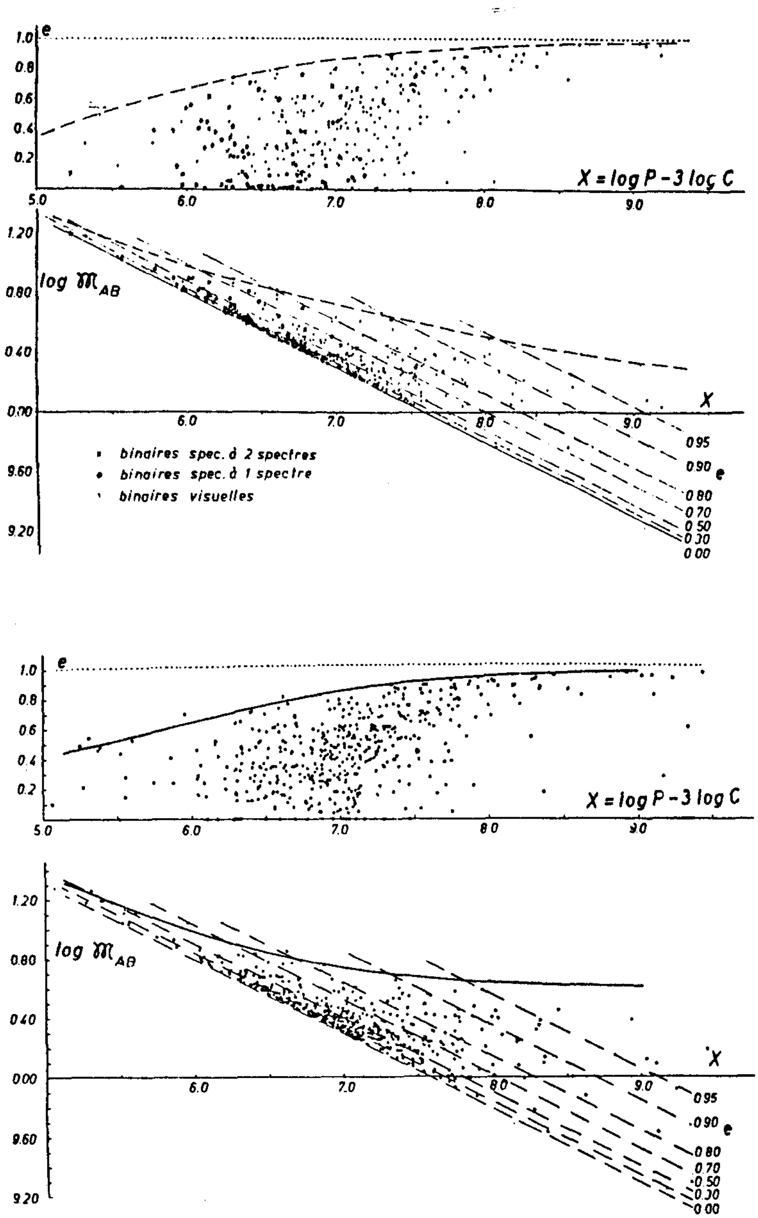

Fig.3.- Diagrammes (X,e) and (X, log$\mathfrak{M}_{AB}$) established by the author in 1963 (above) and with a more recent material (below) (J. Dommanget 1981). The curved lines are well represented by the equation : $e^{2.8} . \mathfrak{M}_{AB} = 3.60$.

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