GENERAL DISCUSSION

Ostriker to Fowler and others: Is it obvious that the optical star in Cyg X-1 really has the mass 30 $M_\odot$? If you take a 30 $M_\odot$ and let it evolve a bit and remove the envelope, does not the luminosity remain the same?

Paczyński: The mass estimate for Cyg X-1 is based on purely geometrical considerations. If we know the distance, the effective temperature and the apparent magnitude of the B-type star, then we also know the intrinsic luminosity and the radius of the star. Now both the radial velocity amplitude and the orbital period are known. Crudely speaking we may say that the star cannot be larger than the orbit is. Therefore we have an upper limit to the orbital inclination, i, and we have a lower limit to the masses. This limit is independent of the theory of stellar interiors.

Fowler to Fricke: Parker suggests that such strong magnetic fields are very buoyant and will bubble to the surface in a short time.

Kraft: An interesting study of globular cluster giants is in a thesis by L. Cathey at Santa Cruz. From U, B, V, R photometry of M92, M13 and 47 Tuc, Cathey found no Sandage-Walker effect; i.e. at a fixed $(B-V)$, he found essentially no difference in $(U-B)$ between the stars of the subgiant and asymptotic giant branches, in accordance with theoretical expectation.

Tayler: I wish to ask two general questions.

(1) Is it possible that the width of the giant branch in ω Cen and the indication of composition differences between stars in clusters could mean that in massive clusters sufficient gas could be retained from a first generation of stars so that a new generation enriched in metals could be formed?

(2) If the distance to the Hyades is incorrect so that there is indeed no discrepancy between evolutionary and pulsational masses of Cepheids, is Dr Woolf happy that no significant mass loss occurs in the red giant phase?

Woolf: I would like to say, on the first question, that some years ago I tried to estimate which systems would and which would not retain the ejecta from giant stars. It seemed that galaxies like the Draco, Sculptor and Fornax systems would lose the mass but that systems a little more massive like that in Sextans should retain the gas, and indeed we see a few regions of hot gas and young stars in such galaxies.

On the second topic, I can only say that we see matter being lost. If anyone needs stars to evolve without mass loss, they had better find a way of putting it back.

Friedjung: I first have a comment about novae. I think that there may be different physical processes for novae, so-called dwarf novae and recurrent novae. Thus, although I am not certain about the paper on T Coronae Borealis, it is possible that different processes are involved.

Friedjung to Tayler: Is it certain that the initial chemical composition of stars in

Tayler (ed.), Late Stages of Stellar Evolution, 254–255. *All Rights Reserved. Copyright* © 1974 *by the IAU*.

https://doi.org/10.1017/S0074180900018374 Published online by Cambridge University Press

a cluster is exactly the same? It seems that when grains condense, the chemical composition of the remaining interstellar gas is changed. When stars are formed, there could be composition variations, if there was a grain-gas separation process. Can someone who knows more about the problem than I do express an opinion?

Iben to Tayler: With regard to the problem of the Cepheids, although I agree that mass is lost in the giant region, I do not believe that the timescale is long enough for enough mass to be lost to affect the evolution of the star.

Some of us have been urging observers to look at the chemical composition of more than one star in a cluster to see if there are important variations. If globular cluster stars are first generation, they must have obtained their metals (however few) from some source. If these metals were produced by explosive nucleosynthesis in the first few times 10^8 yr of the history of the Galaxy, might there be a composition gradient across clusters?

With regard to gas retention in clusters, ω Cen does appear to be ten times more massive than any other cluster in the Galaxy.

https://doi.org/10.1017/S0074180900018374 Published online by Cambridge University Press