composed of cool clouds with temperatures $\sim 100^\circ\text{K}$ and ionized clouds with temperatures $\sim 6,000^\circ\text{K}$, the evaporation of particles with these energies is negligible.

(5) Bashkin seems to assume that the interstellar medium can be considered as made up of single particles moving in magnetic and gravitational fields. However, it must be stressed that it can only be considered as a continuous medium containing a variety of energy sources which is acting under gravitational and magnetic forces. That the viscous forces are strong is shown by the fact that only a very small ionized component of the gas is sufficient to couple the magnetic field to the neutral component^{8,9}. Thus the picture of single atoms migrating into the halo is unrealistic.

Bashkin also remarks that the abundance of helium in Population II stars is incompatible with the nucleosynthesis theory. However, it has been shown elsewhere¹⁰ that this is not so.

We conclude that Bashkin's proposal is unacceptable, and that the usual explanation of the abundance differences among stars as being due to the processes of nucleosynthesis and stellar evolution is to be preferred.

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THE objections raised by Wallerstein and Burbidge to my proposals are themselves subject to question.

(1) The accuracy quoted by Wallerstein and Burbidge for the abundance measurements exceeds or ignores the claims of the original authors. Thus Wallerstein *et al.*¹ mention (maximum) errors of a factor of 4 in the (Fe/H) ratio for HD 165195 and HD 221170, and a factor of 2 for HD 122563. For the other elements cited by Wallerstein and Burbidge, an additional error of a factor of 3 is given by Wallerstein *et al.*¹ in the (element/iron) ratio. These errors omit the effect, possibly large and in the direction to reduce the under-abundances, of the contribution of Raleigh scattering to the opacity^{1,2}. Deutsch³ in particular has found that the apparent under-abundance of the metals in Mira stars is reduced from a factor of one hundred to one of three when Raleigh scattering is considered. Baschek⁴ indeed finds carbon to be deficient in HD 140283; but his result is a factor of ten higher than that of Aller and Greenstein⁴ and he notes that a change of 100°K in the assumed effective temperature causes the deduced carbon abundance to vary by a factor of 1.7. Baschek's result⁵ on the abundance of nickel in HD 140283 differs by a factor of five from the value obtained by Aller and Greenstein⁴. Wallerstein *et al.*¹ state that the data on elements from strontium to europium are so scanty that any theoretical treatment must be cautious. The alleged⁶ under-abundance of manganese relative to iron is to be viewed with reserve because of discrepancies between authors. For example, for HD 140283, Baschek⁵

gives [Mn/Fe] as $+0.51$, while Aller and Greenstein give $+0.01$. One must remark that a small systematic error in Wallerstein's results⁶ on [Mn/Fe] could account for his under-abundance of manganese, and further work on this point would be helpful. The foregoing uncertainties in the data cannot be neglected in attempts to interpret stellar abundances.

The relevance of Traving's B star⁷ is not understood. Since that star is almost certainly far younger than the galaxy, its chemical composition is not simply related to the initial condition of the galaxy. It is entirely reasonable that young, isolated, halo stars should be deficient in all elements more massive than helium simply because of gravitational attraction between those elements and the disk. What is surprising about BD +332642 is that the helium content is normal⁷. This evidence that uncondensed matter in the halo is helium-normal may be further justification for the idea presented in my original communication that ionization and the galactic magnetic field significantly affect stellar compositions in the halo region.

The statement that Burbidge⁸ has satisfactorily explained the (He/H) ratio in Population II stars seems to me to be in serious error. He emphasizes the discrepancy between the observed (He/H) ratio (0.17) and that calculated (0.019) on the assumption that all the galactic helium was built out of hydrogen in stellar interiors, and lists four different, speculative hypotheses to account for this divergence. One of his suggestions leads to the conclusion that stars of small mass should have abnormally low (He/H) ratios. This is apparently contradicted by Traving's work⁷, on Barnard's star, which he finds to have a mass of $0.2 M_\odot$ but a (He/H) ratio only half normal.

(2) Of the stars mentioned by Wallerstein and Burbidge in the preceding communication, only HD 165195 is definitely not a halo star, but no evidence is advanced that this star was formed near the galactic plane.

(3) Certainly the original galactic field extended into the halo region. Equally certainly, that field had a gradient and a time-dependence which could have contributed the disk-ward force I suggested. Lynds and Sandage⁹ have shown how, under some conditions, a galactic magnetic field can very effectively channel the motion of galactic matter. It would be interesting, if observationally possible, to look for element differentiation in M 82. According to my model, the filaments should be rich in metal and poor in helium. The coupling between ions and neutral particles by virtue of collisions and induced-charge effects is an important point. My original communication noted that charge exchange could occur and that the magnetic field would be effective only for such time as a given particle was actually ionized.

(4) I reiterate that the normal (He/H) ratio in Population II stars and the virtual identity of the (metal/H) ratios for young and old stars in the galactic disk present an unsolved problem in the theory which attributes all stellar abundance differences to stellar nucleogenetic processes.

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