outstanding anomaly is the extreme weakness of CN in the low-velocity star β Aql. This, however, might be due to the faint absolute magnitude of this star (the faintest in my programme), which is, in fact, almost intermediate between the subgiants and the main sequence. Because of this difficulty the results for the subgiants are not given. The definitive analysis both for giants and subgiants will be made when all the plates have been completely measured.

The significance of these results is not clear. The most conflicting point is the faintness of the CH band in high-velocity stars. Schwarzschild, Spitzer and Wildt (10) have shown that if H and the elements of the O group (represented by C) are more abundant than metals in high-velocity stars, we should find CH enhanced and CN and Fe weakened in these stars. This is in agreement with previous findings, but my results disagree as far as CH is concerned. If, however, we would adopt a somewhat smaller increase of the ratio of H to metals (A) than that assumed by the aforementioned authors, we probably would get a theoretical variation of molecular bands not in contradiction with my observations. I should like to point out that the weakening of SiH in high-velocity stars might be interpreted as due to an increase of the O to metals ratio (B), due to the formation of SiO.

The present discussion for K giants is admittedly very crude and the final analysis must be made before arriving at conclusions, although I do not see how the preceding results might be seriously changed.

Leaving aside smaller differences, it seems on the whole that we should admit in high-velocity stars a somewhat larger H to metals (A) ratio and also a larger O to metals (B) ratio. This is in agreement with the views expressed by Schwarzschild, Spitzer and Wildt. It must be observed, however, that the present spectroscopic evidence, although not unfavourable, is rather weak. The general difficulties connected with the interpretation of the kinematical properties of K giants cannot be neglected and suggest great caution. Above all we must bear in mind the possibility of transition cases, which are strongly suggested by the distribution of velocities.

Also the spectroscopic observations point toward an intermediate value of (A) for K giants as compared with normal dwarfs and giants on one side and with subdwarfs and high-velocity dwarfs on the other side.

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8. *Exposé de* B. Strömgren

Strömgren gave a brief analysis of three points dealt with in his article on 'Evolution of Stars' (*A.J* **57**, 65, 1952):

1. For main-sequence stars the extent of the convective regions changes with the mass. The more massive stars (A stars brighter than 2^m–3^m) have a convective core roughly corresponding to the Cowling model. The outer convection zone, first considered in connexion with problems of the solar interior by Biermann in 1938, is quite narrow. Passing from bright to faint main-sequence stars one finds that the extent of the convective core decreases, vanishing for faint stars. This is due to the fact that the energy-production mechanism changes from the carbon cycle to the proton-proton process,

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while the relation between opacity and distance from the centre does not change very appreciably. At the same time the outer hydrogen convection zone increases in thickness and reaches appreciable depths.

The transition to vanishing convective core occurs somewhere near the position of the Sun. Epstein's model (*Ap. J* **114**, 438, 1951) for the Sun has a convective core, but more recent calculations based on somewhat modified expressions for the energy generation and the opacity have led to solar models with smaller or vanishing convective core. The model structures are quite sensitive to changes in the energy generation and opacity expressions, and a definite conclusion regarding the Sun has not yet been reached. It is fairly certain that the K stars of the main sequence do not have a convective core, while the outer convective zone strongly affects the internal structure here. It has been suggested that stellar model calculations for K-type main-sequence stars in which the effect of the outer convective zone upon temperature distribution and energy production is taken into account, might yield results compatible with observed masses, radii and luminosities (e.g. for Kruger 60 A.), and thus remove a difficulty that has been encountered here, namely that the energy production computed for models without outer convection zones according to the proton-proton process comes out too high, irrespective of the assumed composition. Such calculations are now in progress.

In slowly rotating stars large-scale mixture of the material during the lifetime of the star is negligible outside the convection zones. For the brighter main-sequence stars this leads to evolution tracks of the exhausted-core type. Stars of solar type during their evolution might develop non-mixed central regions in which the mean molecular weight increases appreciably with decreasing distance from the centre. For faint main-sequence stars the corresponding variations of mean molecular weight are quite small, because the rate of transmutation of hydrogen into helium is so low.

2. In discussing differences between the H–R diagrams of globular clusters and open clusters differences in chemical composition should be considered as well as differences in age. If the stars in globular clusters (population II) have a smaller heavy element content than stars in open clusters (population I), then they will be more luminous for their mass, and evolution will proceed faster.

3. If it is assumed that all massive, luminous stars after they have exhausted their hydrogen supply ultimately become white dwarfs of small mass, then these stars are potential sources of interstellar helium, and the rate of production of interstellar helium can be computed from the luminosity function and an average mass-luminosity relation.

If a star loses an appreciable amount of its mass through corpuscular radiation during the period when it is converting its hydrogen into helium, there will be a reduction in the rate of production of interstellar helium, but the reduction will only be serious if the shedding of mass by the star proceeds so rapidly that the amount of helium which goes into the white dwarf is comparable to the total amount of hydrogen converted into helium during the lifetime of the star in question.

If it is assumed that the rate of production of interstellar helium has remained constant through 3×10^9 years, the average density of interstellar helium produced in our neighbourhood in the galactic system is somewhat less than, but comparable to, the average density of interstellar hydrogen. The rate of production of interstellar helium varies strongly in space within our galaxy.

These considerations emphasize the importance of observations on the ratio of the densities of interstellar helium and hydrogen. So far interstellar helium emission lines have been observed with certainty only in the denser central regions of the Orion nebula. However, upper limits to the helium emission line intensities in typical interstellar regions have been established through observations at the Observatoire de Haute Provence and at Yerkes Observatory and the efforts to find interstellar helium emission are being continued.

[*Note added to manuscript.* Hugh M. Johnson, Yerkes Observatory, has recently observed interstellar helium emission (λ5876) in NGC 6523, the Lagoon nebula.]