is more massive than the other, its contraction stages will take place more rapidly. At the time this component reaches the main sequence, the less massive component will not be able to retain the material lying outside the Jacobian limiting surface, and this must be acquired by the other component or be lost to the system. Qualitatively this concept offers a possible answer to the problems cited. The mass ratios may become large because much of the original mass was either lost or acquired by the more massive star. The secondary component will be hydrogen-poor, and hence will have a higher central temperature than normal for its mass and the composition of the original mixture; thus its departure from mass luminosity would always be in the same direction. If the heavier component also loses mass it will be overluminous for the same reason; if it does not, it will be normal; if it acquires much of the hydrogen which otherwise would have gone to the secondary, it will be underluminous. These cases all exist. Finally, the less massive components will be found at the limiting boundary surfaces, not because of normal evolution, but because the matter beyond this limit was lost to the other component or to the entire system.

Temperature Determinations for Nuclei of Thirteen Planetary Nebulae. H. ZANSTRA AND L. H. ALLER, *The University of Michigan Observatory*.—The temperature determinations presented are based on calibrated slitless spectrograms showing monochromatic images as well as the continuous spectrum of the central stars. Since relative intensities of the emission lines were available, only the A_v value of one of the monochromatic images as compared with the adjoining star spectrum was required in addition to the electron temperature which plays a minor part. Also the influence of interstellar reddening is of minor importance. The stellar temperatures obtained were T_H from the recombination of hydrogen, T_{ee} from the electron energy exciting the forbidden lines, and T_{HeII} from the $HeII$ recombination spectrum, the star being formally treated as a blackbody and the absorption of ionizing quanta being considered complete. With one exception,

the six nebulae having no observable $HeII$, all yield $T_H > T_{ee}$. If the absorption of ionizing quanta were incomplete, one should have $T_H < T_{ee}$. We may conclude, therefore, that the combination of a blackbody energy distribution with complete absorption is sufficient to explain the H absorption region. Literally speaking, the absorption would be more than complete. The seven nebulae showing $HeII$ all yield $T_{HeII} \gg T_H$ and moreover, with one exception, $T_H < T_{ee}$. The latter fact may be understood by the Lyman-alpha line of $HeII$ giving additional ionization of the hydrogen with large photo-electron energies. As a model one might tentatively adopt a temperature T_H for the wavelength region $\lambda > 228$, and a much higher temperature $T_{HeII(H)}$ for the region $\lambda < 228$, so there appears to be an ultraviolet excess produced by some unidentified mechanism. The stellar temperatures T_{HeI} from recombination of helium were about 4000° higher than T_H , on the average. A similar discrepancy is indicated by the spectral energy distribution of the corresponding far ultraviolet regions $\lambda < 509$ and $\lambda < 912$ from model stellar atmospheres of O stars.

The Energy Equilibrium of the Solar Chromosphere. J. B. ZIRKER, *Sacramento Peak Observatory*.—Athay and Thomas (1956) investigated theoretically the temperature structure of the solar chromosphere permitted by the requirements of energy equilibrium. They were able to apply their results in either of two extremes: either (a) under conditions of very high local opacity, when the net emission at the wavelength in question is zero, or (b) under conditions of very low local opacity when self-absorption can be neglected. Methods for the treatment of situations intermediate to these extremes have been developed since 1956. This paper presents one formulation of these methods and applies them to the solar chromosphere. Stable temperature intervals emerge below $10\,000^\circ\text{K}$ and around $60\,000^\circ\text{K}$ based, respectively, on hydrogen and ionized helium emission. The interval between $15\,000^\circ\text{K}$ and $40\,000^\circ\text{K}$ appears to be unstable.

NEW BOOKS RECEIVED

- Himmelsmechanik, Band 1.* by Karl Stumpff, published by Deutscher Verlag der Wissenschaften, Berlin 1959. Price DM 56.80.
The Structure and Evolution of the Universe, by G. L. Whitrow, published by Harper and Brothers, N. Y. \$1.45.
Second Conference on Coordination of Galactic Research, I. A. U. S. No. 7, A. Blaauw, editor, published by Cambridge University Press, New York. Price \$3.00.
Astronomischer Jahresbericht, Band 57, Die Literatur des Jahres 1957, Astron. Rechen-Inst. in Heidelberg, published by Walter de Gruyter and Co., Berlin. Price DM 60.
Recent Advances in Atmospheric Electricity, Proc. 2nd Conf. on Atmospheric Electricity, L. G. Smith, editor, published by Pergamon Press, Inc., New York. Price \$17.50.
Electromagnetic Phenomena in Cosmical Physics, I.A.U. Symposium No. 6, B. Lenhart, editor, published by Cambridge University Press, New York. Price \$10.00.
Magneto-Ionic Theory and Its Application to the Ionosphere, by J. A. Ratcliffe, published by Cambridge University Press, New York. Price \$7.50.
The Theory of Space Time and Gravitation, by V. Fock, translated from the Russian by N. Kemmer, published by Pergamon Press, New York. Price \$15.00.