in general that neutrino emission cannot act as a thermostat in stars with $M > 1.4 M_{\odot}$ in which the hydrostatic equation still holds.

The Use of a Digital Computer in the Solution for the Elements of Eclipsing Binary Stars.

GEORGE W. COLLINS AND C. M. HUFFER, *Washburn Observatory, University of Wisconsin*.—It is the purpose of this paper to describe a recent application of a high-speed digital computer to the solution for the elements of eclipsing binary stars.

The method of reduction is primarily that of Kopal using rectified light curves. A description of the method and how it was adapted to machine use form the main body of the paper. The machine formulation has been carried out in a sufficiently general language so as to make it useable on several different high-speed computers. Details of the machine requirements are also given.

The star selected for discussion is S Cancrī, using photoelectric observations made at the McDonald Observatory, and in Madison in 1951, and at Kitt Peak in 1960. The eclipse is total. The fundamental equation includes a term for the computation of the darkening coefficient. It is hoped to use this method for other stars including AR Cas and VV Ori.

The Determination of the Velocity Vector of a Space Vehicle from Apparent Changes in the Angular Separations of Stars.

OLIVER C. COLLINS AND WALTER F. HILTNER, *Boeing Airplane Company—Aero Space Division, Seattle 24, Washington*.—In the course of interplanetary travel the apparent relative positions of stars and the angular measurements of their separations will not be altered significantly by the changes of location which are achieved by the vehicle. Nevertheless, on account of the aberration of light, while the vehicle is in motion small but highly significant variations of these angular positions of the stars will be apparent. These facts provide a basis for the immediate determination of the speed of the vehicle and of its instantaneous direction of motion. Also, a continuous record of the velocity vector against time would provide the basis for a determination of the dead-reckoning position in space. This paper provides a mathematical development appropriate for interplanetary vehicular speeds of the same order as the orbital speed of the earth.

On the Adams Prize Problem for 1856. ALLAN F. COOK AND FRED A. FRANKLIN, *Harvard College Observatory and Smithsonian Astrophysical Observatory, Cambridge, Massachusetts*.—The question of the dynamical stability of Saturn's rings has a direct and immediate bearing upon all discussions of struc-

ture and particle size. The famous essay of J. C. Maxwell considers in elegant detail the dynamical stability of a ring of zero thickness in which collisions are not important. His calculation for the case of finite thickness of the ring is in error and we have modified it to arrive at a criterion of dynamical stability increasing Maxwell's upper limit on the density by more than an order of magnitude.

Consideration of the effect of collisions leads to the following results: First, the accommodation coefficient for interparticle collisions must exceed some minimum value (about one-half), or input to random motions from friction would exceed output to radiation of heat generated in the particle surfaces by impacts, and the ring would expand in thickness. Second, the efficiency of the above input diminishes as the ring becomes thinner so that an equilibrium between the two processes may be expected at much greater random velocities and thickness of the ring than from thermal motions alone. The collapse to a thickness corresponding to thermal motions will only occur if the accommodation coefficient is approximately unity. Third, the combination of an accommodation coefficient in the above range and of viscosity operates to stabilize the rings against infinitesimal disturbances provided the density does not exceed approximately one-fifth that of Saturn.

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Motions in Bright Rim Structures in Diffuse Nebulae.

G. COURTES AND S. R. POTTASCH, *Observatory of Marseille and Observatory of Paris, Meudon (Seine et Oise), France*.—Present theory (Kahn, F., *Bull. Astron. Inst. Neth.* 12, 187, 1954; Pottasch, S. R., *ibid.* 14, 29, 1958) regards the bright rim structures in diffuse nebulae as ionization fronts, the result of interaction of ionizing radiation from an exciting star with dense un-ionized matter in the nebulae. This theory can be definitely confirmed by observing the predicted motion of the ionized material away from the ionization front at about the speed of sound. Proper motion studies will not reveal this motion because there is no way of marking a particular point in the ionized gas, so that recourse must be made to radial velocity measurements. Because these bright rim structures are observed primarily in the plane of the sky any radial velocity shift will be observed at the same position as the dark matter.

The observations were taken at the Newtonian focus of the 193-cm telescope of the Observatory of Haute Provence, with a Fabry-Perot interferometer, especially built for this purpose (Courtes, G., *Ann. astrophys.* 23, 115, 1960). It enables one to obtain