luminosity is fed in from below. Each envelope is initially set into a good approximation to hydrostatic equilibrium, then released and followed in time. A small, residual "jostling" of the envelope, resulting from minor departures from hydrostatic equilibrium, persists for a time after the release and provides a small perturbation for the initiation of pulsations if the envelope is unstable.

The calculations have revealed the existence of an "instability strip" on the Hertzsprung–Russell diagram for envelopes having a helium/hydrogen ratio of 0.15 by number. The boundaries of the strip have not been accurately located but its width (at constant L_{eq}) is estimated to be $\Delta \log R_{\text{eq}} \approx 0.11$ and its location agrees approximately with predictions based on the linear theory. The strip lies somewhat to the left of the observed Cepheid instability strip, however, because the fundamental pulsations of our envelopes correspond approximately to first-over-tone pulsations of real stars.

The two envelope models which lay within the instability strip both developed fundamental radial pulsations whose amplitude grew exponentially in time, with e -folding times (for radius amplitude) of 50 to 100 natural periods. After a number of e -folding times, the amplitude leveled off to a steady value of some 4 to 5% (in radius semi-amplitude) in both cases. The final, limiting amplitude was found to be independent of starting conditions. Envelope models lying close to but outside the strip or having insufficient helium content were found to be stable. The results suggest that the limiting pulsation amplitude of classical Cepheids is determined primarily by a "saturation" of the destabilizing effects of second helium ionization, as proposed by Ledoux and Whitney [*Aerodynamic Phenomena in Stellar Atmospheres*, edited by R. N. Thomas (Supplemento del Nuovo Cimento, Bologna, 1961), Vol. XXII, No. 1, p. 152].

Machine Computation of p Functions for the Solutions of Eclipsing Binary Systems. WALTER D. DAVIS (introduced by C. M. Huffer), *San Diego State College*.—The purpose of this paper is to present a method of computation of the p functions by means of computing machinery. It has been shown (Kopal, Z., *Close Binary Systems*) that the p functions $p(\alpha, k, x)$ are the result of numerically inverting the associated alpha functions $\alpha(p, k, x)$, where the geometric depth p is a function which depends on the circumstances of the eclipse, k is the ratio of the radii, and x is the limb-darkening coefficient. $\alpha(p, k, x)$ is expressed in terms of the two lower-order associated alpha functions for stars of uniform brightness α_0^0 and those completely darkened at the limb α_1^0 .

Equation (5–35) of *Close Binary Systems*,

$$\frac{\partial \alpha_n^0}{\partial \delta} = - \frac{2}{r_2} \left(\frac{r_2}{r_1} \right)^{n+2} I_{-1, n}^1,$$

represents the change of the fractional loss of light α with respect to the distance δ between the centers of the two binary stars during eclipse. The distance between centers δ is a function of the radius of the larger star r_2 , the ratio of the radii $k = r_1/r_2$, and the geometric depth p .

The problem of evaluation for $n=0$ for various values of k and p has been developed as a closed solution and offers no difficulty. There remains the reduction for $n=1$ to a convenient form for numerical integration. By means of a substitution, (5–35) becomes

$$d\alpha_1^0/dp = -(2/k^2)I_{-1, 1}^1,$$

where $I_{-1, 1}^1$ is a function of certain J integrals. The final form reduces to

$$\frac{d\alpha_1^0}{dp} = - \frac{4}{3\pi} \frac{(1+kp)^{\frac{1}{2}}}{k^2} [(1+\mu)F - 2\mu E],$$

where F and E are complete elliptic integrals of the first and second kind, respectively, with modulus κ^2 , and

$$\begin{aligned} \mu &= 1 - 2\kappa^2 = (r_2^2 - r_1^2 + \delta^2)/2\delta r_2, \\ \kappa^2 &= k^2(1 - p^2)/4(1 + kp). \end{aligned}$$

The differential equation for the fractional loss of light for the completely darkened star is now in a form which can be evaluated readily by means of Gaussian mechanical quadrature. With the introduction of the equation for the linear law of limb darkening.

$$\alpha^x = [3(1-x)\alpha_0^0 + 3x\alpha_1^0]/(3-x)$$

the evaluation of $\alpha^x = \alpha(p, k, x)$ has been accomplished on a digital computer and then inverted to yield the tables of the p functions for the occultation eclipse.

Automatic Processing of Solar Observational Data. EDWIN W. DENNISON, *Sacramento Peak Observatory*.—The fullest utilization of modern high-speed data reduction computers can only be realized when the data can be efficiently recorded in a suitable digital data medium such as punched cards. Effective data processing systems must be developed to the point where they do not encumber the operator or interfere with the normal procedures of data recording. A system for recording microphotometer and Doppler comparator signals on punched cards has been developed at the Sacra-