tinua, we obtain the mean intensity as an integral over the source function. The radiative absorption rate (mean intensity integrated over the absorption coefficient) is then found by quadrature—Gauss—Hermite for bound-bound transitions or Gauss—Laguerre for bound-free transitions. Because of the coupling between the various levels, one must proceed by iteration.

Results are shown and described in detail. At very large values of the optical depth ($\tau_{21} \gtrsim 10^{12}$) the populations assume their equilibrium values and the nonequilibrium parameter $b_j=1$. Far out in the atmosphere we find that $b_1 > 100$ while b_2 and $b_3 < 1$. Graphs of the source function and the departures from equilibrium as functions of optical depth are displayed and discussed.

A Scale Model Study of the Bosomtwe Crater.

G. H. S. JONES AND C. H. H. DIEHL (introduced by C. S. Beals), *Suffield Experimental Station*.—The main features of the Bosomtwe crater, in Ashanti, Ghana, are compared with the corresponding features of the crater produced by the detonation of 500 tons of TNT in Alberta, Canada. It is shown that on a scale basis Bosomtwe could be produced by the detonation of a 1000 megaton nuclear charge, or by the impactation of a meteorite with a velocity of the order of 10 km/sec, and a diameter of a few hundred meters. It is suggested that some of the associated circumferential drainage system may be controlled by circumferential cracks corresponding to those produced by the 500-ton charge.

Escape Rates from Star Clusters. IVAN R. KING, *University of California, Berkeley*.—Cluster models have been calculated on the basis of steady-state velocity distributions. The models are finite in extent (because of the effect of galactic tidal forces) and contain a realistic mixture of five different stellar types. They can be fitted to star counts in actual clusters, and the fitting then gives values for relaxation times and escape rates.

Escape rates depend in a well-known way on the mass of a cluster and its radius, but they also depend strongly on the central concentration. Low-mass stars escape only a little faster than those of average mass. In some globular clusters the loss of stars in 10^{10} yr has been appreciable. In galactic clusters the loss rate is of course much faster; its past history depends strongly on changes in the cluster radius, caused by evolutionary mass loss and external forces.

Exploratory Photoelectric Scans of β Lyrae.

ROBERT H. KOCH, *Amherst College Observatory*.

Between 0^p26 and 0^p57 β Lyr has been observed from $\lambda 3500$ to $\lambda 6000$ with the photoelectric scanner on the Mount Wilson 60-in. reflector. The scans were made with an exit slot of 5 Å in the second order. Standardized relative monochromatic magnitudes from $\lambda 3509$ to $\lambda 5840$ have been supplemented by additional monochromatic magnitudes at $\lambda 5715$ and $\lambda 6000$. The observations are in satisfactory agreement with the U, B, V photometry (Wood, D. B., and Walker, M. F., *Astrophys. J.* **131**, 363, 1960). When corrected for the reddening evaluated by Abt *et al.* (*Astrophys. J.* **135**, 429, 1962), the mean representation of the monochromatic magnitudes that are free of emission suggests the spectral type of the cool component to be about A5.

He I is in emission at $\lambda\lambda 4472, 4713, 4922, 5016, 5048$, and 5876 . In addition, H β appears in emission. With the low spectral purity of the scans probably all these lines are blended with other weak emissions and absorptions. The emissions due to transitions among the triplet states of He I strengthen as secondary eclipse is attained while those associated with the singlet states weaken.

The scans have been planimetric in strips 100 Å wide and, as far as possible, weighted by the B and V sensitivity responses. On the assumption that the fractional luminosities of the β Lyr components are about equal through the V response, corrections have been made for the percentage line absorptions expected for supergiant stars of spectral types B8 and A5. This procedure permits an evaluation of uneclipsed third light in the system: $L_3(V) = 8\% \pm 2\%$ and $L_3(B) = 4\% \pm 2\%$. The quoted uncertainties are estimates; internal scatter of the scans leads to probable errors of $\pm 1\%$. Both the B and V light curves permit the possibility of third light of several percent. The scans neither confirm nor deny the possibility that a continuum can also contribute additional uneclipsed third light.

A High-Sensitivity Map of the M31 Region at 1415 Mc/sec. J. D. KRAUS AND R. S. DIXON, *Ohio State University Radio Observatory*.—The Ohio State University 260-ft radio telescope has been used to

conduct a high-sensitivity survey of M31 and surrounding regions at 1415 Mc/sec. A strip 2.5 hr in right ascension by 4° in declination, has been mapped. Beamwidths are 10 min of arc in right ascension by 38 in declination. Using a liquid-nitrogen-refrigerated parametric amplifier, digital output, and repeated scans a sensitivity (rms noise temperature) of 0.01°K was achieved with all data reduction done on the university's IBM 7094 computer.

On the new map M31 is resolved into 6, and possibly 10 components, 7 of which lie on or close to the major axis. There is no indication of emission from