of the galactic system. The influx of momentum, partly as a result of (1) and (2), will force the gas to expand. By theoretical arguments it is shown that the charged component of the gas will have preference to expand in the direction where the magnetic field is weakest, dragging along the neutral component. Thus the incoming excess matter will expand through the polar regions of the magnetic field, hence the emergence of spiral arms from two diametrically opposite regions.

Masses of the Components of Zeta Aurigae.

DANIEL M. POPPER, *University of California, Los Angeles*.—The masses of the components of the well-known eclipsing system, Zeta Aurigae are re-investigated by means of new spectrographic material obtained expressly for the purpose. The critical quantity needed is the amplitude of velocity variation of the B7V component, that of the K4II component being known. (The spectral types are those of Wellmann.) The difficulty of mass determination lies in the circumstance that the lines of the B star are broad and badly distorted by the numerous sharp lines of the K star.

The new material consists of 35 Mount Wilson spectrograms, dispersion 10 Å/mm, strongly exposed in the spectral region $\lambda\lambda$ 3700–4000. Most of the spectrograms were obtained near times of the extremes of velocity variation. In order to calibrate the method of reduction, 26 composite spectrograms of stars of known velocity were used. Each of these spectrograms consists of the superposed spectra of two stars of spectral types similar to the types of the components of Zeta Aurigae. The method of reduction involves the measurement on microdensitometer tracings of the positions of numerous metallic lines of the K star relative to the broad hydrogen lines, $H\epsilon$, $H9$, $H10$, $H12$, $H13$, and $H14$, of the B star.

The provisional resulting values of the masses are 8.0 and 5.8 solar masses for the K star and B star, respectively. These results may be compared to the most recently published evaluation (Wellmann, P., 1951, *Astron. Nach.* 279, 257) of 22.0 and 10.2 solar masses. The estimated mean errors of the masses are 15%.

Stellar Motions in Spherical Galaxies. A. POVEDA, C. CRUZ, AND G. BATIZ, *Tacubaya and Tonantzintla Observatories*.—The statistics of stellar orbits in spherical galaxies has been investigated and the observable consequences of several mixtures of circular orbits and radial oscillations have been computed for spherical galaxies.

The starting point is de Vaucouleurs' interpolation formula for the projected brightness of an E_0 galaxy. From this, by integration, space densities and potentials have been found (Poveda, A., Itur-

riaga, R., and Orozco, I., 1960, *Boletín Obs. Tonantz. Tacub.* No. 20) which in turn are used to compute space velocities for two separate cases: (a) circular orbits; (b) radial orbits. In this case, a knowledge of the distribution of apogalactic distances is needed; the latter was derived from the present mass distribution. It was found that the space density of apogalactic distances nowhere becomes negative and hence the hypothesis of radial motions cannot be ruled out on this account.

For each of these two cases by further integrations the observed velocity dispersion was computed as a function of distance to the center of the image of a spherical galaxy. It was found, in the case of circular orbits, that the velocity dispersion increases rapidly from zero at the center to a maximum value (whose magnitude, of course, depends on the mass and scale of the particular galaxy to be investigated) and then decreases slowly. On the other hand, radial orbits produce a maximum velocity dispersion at the center of the image which decreases rapidly with distance.

In order that the observed velocity dispersion is kept constant, independent of distance to the center of the image, an approximate mixture of 83% circular orbits and 17% radial orbits is required.

As no obvious changes in the magnitude of the velocity dispersion have been reported, the previously mentioned mixture seems to be a close estimate to the truth.

A corollary of this work is a formula which relates the mass of the galaxy to the scale and the observed velocity dispersion (as a function of distance to the center of the image). This relation offers a more accurate determination of masses of spherical galaxies than those previously given.

The Mass-Luminosity Ratio of the Local Cluster of Galaxies.

A. POVEDA, C. CRUZ, AND G. BATIZ, *Tacubaya and Tonantzintla Observatories*.—It is well known that the mass/luminosity ratio of clusters of galaxies is $\gtrsim 500$; this has been interpreted as owing to expansion of the clusters, much like the expanding associations of stars in the galaxy. Therefore, a study has been made of the local cluster in the light of the previous considerations.

We have assumed that the galaxies in the local cluster describe radial oscillations around the center of mass, which has been identified with M31, as it is the most massive member. With this model it is possible to estimate from the observed radial velocities, corrected for galactic rotation, the space velocity relative to the Andromeda Nebula.

For the 13 galaxies investigated it was found that eight are receding from M31 and five are approaching it. This we take as a further indication that the cluster is stable and, therefore, not expanding; thus