the red giant stage, whereas the G5 component ($M = 3.03 M_{\odot}$) is now in the core He-burning stage.

Mass Models of the Galactic System. KIMMO A. INNANEN, *David Dunlap Observatory and University of Western Ontario*.—Models of the galactic mass distribution have been obtained using Schmidt-type nonhomogeneous spheroids. Values of the distance of the sun from the galactic centre of 8.2 and 10.0 kpc with circular velocities near the sun varying from 200 to 250 km/sec were adopted. Each model reproduces a rotation curve which is the smoothed mean of the Leiden and Sydney 21-cm results, together with the Leiden 21-cm observations of the rotation near the galactic center. The total density near the sun was taken to be $0.15 M_{\odot}/\text{pc}^3$. The principal characteristics of the models have been evaluated with an electronic computer.

The models show that the mass in a column of unit area at the sun's position, perpendicular to the plane of the model, increases with increasing circular velocity near the sun. The observed mass perpendicular to the plane near the sun is reproduced if the circular velocity near the sun is approximately 200 km/sec. This low value of the circular velocity makes it unnecessary to introduce unknown matter to the model. The total masses of the models vary between 0.6 and $1.2 \times 10^{11} M_{\odot}$. All of the models may be modified without significantly changing the results if a considerable fraction of the total mass is distributed in Schmidt-type spheroids with little flattening.

A comparison of the models with M31 has been made by tilting them to the apparent attitude of M31, and by obtaining "mass profiles" of the resulting long axes of the tilted models. These profiles may be compared with de Vaucouleurs' (*Astrophys. J.* 128, 465, 1958) photometry along the long axis of M31. The comparison with the models is very good, confirming the existence of additional mass in the central parts of the galactic system.

A comparison has also been made between the angular momentum distributions of the models and that of a uniformly rotating, homogeneous spheroidal gas cloud, following the method of Crampin and Hoyle (*Astrophys. J.* 140, 99, 1964). The comparisons are good and thus tend to confirm the conclusion that the galactic system may have collapsed from such a cloud, without turbulent mixing.

Theoretical Departures from LTE for Neutral Sodium in the Solar Photosphere. HOLLIS R. JOHNSON, *Indiana University*.—Departures from LTE (local thermodynamic equilibrium) to be expected for neutral sodium in a solar model photosphere have been calculated theoretically. An iterative, self-consistent procedure is used to solve the steady-state and radiative transfer equations, so that the radiation field due to the atom is consistent with that in which the atom finds itself.

Model sodium atoms of 2, 3, and 5 levels (3s, 3p, 4s, 3d, 4p) are studied to show the influence of the number of levels used. The model atmosphere is that used by the Paris Observatory group in their investigations of departures from LTE. The effect of different models of turbulence is studied.

Numerical values of the nonequilibrium parameters b_i are given throughout the photosphere and low chromosphere. For a two-level atom, departures from LTE are found in the sense that the energy levels are overpopulated in the region $\tau \lesssim 0.001$, underpopulated in the region $0.001 \lesssim \tau \lesssim 1$, and have their equilibrium values for $\tau \gtrsim 1$ (τ here being at 5000 Å). The addition of more levels increases the overpopulation in the chromosphere but brings the populations very close to equilibrium in the photosphere. Reasons for this behavior are discussed. The effect of varying the collision cross sections and radiation fields is discussed. It is concluded that although large departures from LTE exist from neutral sodium in the chromosphere, theoretical calculations predict no significant departures in the solar photosphere (below $\tau \approx 0.1$, say).

The source function for the Na D lines is discussed. It is pointed out that, the source function is collisionally dominated, not photoionization dominated as had been expected on the basis of previous work by Jefferies and Thomas (*Astrophys. J.* 125, 260, 1957; *Astrophys. J.* 129, 401, 1959).

On Certain Forced Responses of a Differentially Rotating Disk of Stars. WILLIAM H. JULIAN AND ALAR TOOMRE, *Massachusetts Institute of Technology*.—It is shown that the density patterns incited within a stable, differentially rotating, highly flattened star system (such as the stellar part of a disk-like galaxy) by the gravitational forces stemming from any additional, steadily orbiting mass concentrations (such as those of the interstellar material) must be characterized by quite extensive elongated features inclined in the usual trailing spiral sense.

With the disturbance self-attractions of the stars themselves taken into account, even the amplitudes of such response densities are found to be remarkably large.

Radio Astronomy Observations with the $8.4 \times 10^4 \text{ m}^2$, 50 Mc/sec Antenna of the Jicamarca Radar in Peru. W. K. KLEMPERER AND G. R. OCHS (introduced by R. S. Lawrence), *Central Radio Propagation Laboratory*.—Some features of a survey