survey, models in quasi-static equilibrium have been constructed for masses in the range $10^2 M_\odot$ to $10^9 M_\odot$ and central temperatures in the range 10^6 K to 3×10^9 K.

It is found that, with increasing central temperature and decreasing radius, the binding energy of a quasi-static configuration of fixed nucleon rest mass first increases through positive values, passes through a maximum, and then decreases rapidly to large negative values (~ -70 MeV per nucleon at $T_c \sim 3 \times 10^9$ K and $M \sim 10^6 M_\odot - 10^9 M_\odot$). The central temperature at which the binding energy first attains negative values follows the rough law $T_c \sim 7 \times 10^{13} (M_\odot/M)^\circ$ K.

It is concluded that, after reaching the maximum in the binding energy curve, massive stars do not pass through quasi-static equilibrium stages. If, on reaching this maximum, matter in the massive star is stable against dynamic motions, then the star must break up into smaller components with an increase in the net binding energy of the system. If the matter is unstable dynamic motions, then central regions will implode and realistic models require a solution of the full dynamical equations of general relativity. A criterion is established for distinguishing between these two possibilities.

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Dynamical Models for Spherical Stellar Systems.

IVAN KING, *University of Illinois Observatory*.—By use of Jeans' theorem an assumed velocity distribution may be developed into a self-consistent model of a spherical stellar system. The first step is to determine density as a function of potential by quadratures over the velocity distribution; then Poisson's equation is solved for the spatial distribution of potential. A computer program has been written to carry out this process. The assumed velocity distribution is Maxwellian, modified to drop to zero at an escape velocity. The velocity distribution is everywhere isotropic, with a different velocity dispersion for each stellar type. Up to ten stellar types can be mixed in a single model. The resulting density distributions are projected onto the plane of the sky, for easy comparison with observation.

Models have been calculated that represent the observed star densities in globular clusters, assuming velocity dispersions in accordance with equipartition of energy. For spherical galaxies, however, the search for a uniquely correct model is hampered by a lack of observational information. Many different stellar mixtures give models that fit a given brightness distribution. Radial color changes are a useful discriminant; and here equipartition models

have their greatest difficulty—achieving a high enough mass-luminosity ratio without making the outer envelope much too red. Other models have been calculated in which an old type I population is supplemented by a bluer, more widely spread type II population. Many of these models can be made to fit observed distributions of both brightness and color. Choice of a dynamical model for a spherical galaxy seems to require further observations of radial changes—particularly velocity dispersions, line strengths, and long-baseline colors.

Some Structural Properties of Galactic and Globular Clusters. II.

T. D. KINMAN, *Lick Observatory*, AND R. W. MICHIE, *University of California, Berkeley*.—Examination of about 50 globular clusters shows that the ratio of the radius at which the cluster surface brightness falls to half the central value to the radius containing half the total light is a good indication of the model parameter C which describes the inner structure of the cluster. Observational and theoretical evidence agree that the galactic tidal force only affects the outermost parts and not the main mass of a cluster. There is no evidence that the model parameter is determined by the cluster's metal content.

The mean density and linear scale of the clusters correlate with galactocentric distance (R_g): clusters nearer the galactic center are smaller and denser. The model parameter shows little dependence upon R_g for $R_g < 25$ kpc; beyond this distance all clusters have model parameters corresponding to eccentric stellar orbits.

The model parameter correlates with the cluster's mean density in the sense that dense clusters have isotropic stellar orbits. High density and isotropy of the stellar orbits both favor dynamical evolution so that such clusters are likely to be the most evolved. The model parameter also shows some dependence upon the cluster's total energy. This might be expected since the total energy and angular momentum are not completely independent quantities in view of the constraint imposed by the velocity of escape. Although a clear distinction between the relative roles of these two parameters is not possible from the present data, the evidence supports the importance of the angular momentum in determining the structure of a cluster.

Finite Atom Approximation for Two-Electron Systems.

WASLEY S. KROGDahl, *University of Kentucky*.—The nonrelativistic wave functions of S states of a two-electron system may be determined from a system of partial differential equations of the second order in two independent variables,