ABSTRACTS

23.03 High-Velocity Main-Sequence A Stars, P. B. STEVENS, MLOCO. A sample of A and F stars has been selected from the Smithsonian Astrophysical Observatory Star Catalogue whose spectral types, apparent magnitudes, and proper motions suggest transverse velocities \( \sim 100 \) \( \text{km/sec} \); the proper motions have been confirmed by independent catalogues. This sample represents a few centiles of a percent of the total number of A\(\text{F} \) stars in the SAO catalogue. Strongen four-color and H\(\beta \) photometry has been obtained for southern stars in this sample to identify horizontal-branch stars and stars that have been erroneously included because of incorrect spectral types or apparent magnitudes (\( \sim \) \% of the sample). Roughly two dozen A stars remain which appear to be main-sequence stars with transverse velocities \( \sim 80 \) \( \text{km/sec} \). Radial velocities have also been measured for most of these stars. This sample, selected on the basis of large transverse velocities, is found to have a large dispersion of radial velocities: \( \langle V_r \rangle \sim 60 \) \( \text{km/sec} \) for stars with \( V_r \sim 80 \) \( \text{km/sec} \). This argues against these stars' merely representing the tail of a Gaussian Pop. I velocity distribution; therefore, either (a) they represent a distinct stellar population, or (b) the Population I velocity distribution is non-Gaussian.

23.05 Spiral Structure and Star Formation. I. Formation Mechanisms and Mean Free Paths, W. W. ROBERTS, JR., and M. A. HAUSMAN, U. Virginia. We present a model of spiral galaxies in which the ISM is simulated by a disk full of gas clouds which orbit ballistically, collide dissipatively, and give birth to star clusters. When a small, spiral perturbation is added to the gravitating disk, the cloud distribution responds with a strong "shock". The young star population exhibits a strong spiral pattern if cloud collisions are important star formation mechanism, but models in which propagating star formation (SSFR) dominates are unstable and show only transient spiral structure. The region of peak cloud velocity dispersion leads the locus of peak cloud density. These results are found to be independent of the cloud system's collisional mean free path (between 200 and 1000 pc). Although continuum and "cloud-fluid" models can also approximately reproduce the global structure of a cloudy ISM, they do not represent local effects (scales of a few hundred pc) as well.

23.06 Spiral Structure and Star Formation. II. Stellar Lifetimes and Cloud Kinematics, M. A. HAUSMAN and W. W. ROBERTS, JR., U. Virginia. We present further results of our cloudy-ISM models of spiral galaxies. Increasing the average life span of young, "spiral tracer" stars beyond about 20 Myr washes out the spiral pattern evident in shorter-lived stars. Allowing clouds to form several successive star clusters (sequential star formation) increases the overall formation rate but does not significantly alter the coherence of spiral arms. The mean velocity field of clouds shows oval streamlines, very similar to continuum gas dynamical calculations, although individual orbit-segments are ballistic. Newly formed star clusters leave the cloud density peak at higher than post-shock velocities and do not recross the "shock" region. By varying our parameters within physically plausible limits, we may reproduce spiral galaxies with a wide range of morphological appearances.

23.07 Computer Simulations of Gravitational Encounters between Pairs of Binary Star Systems, J. B. Hoffer, Michigan State University. Encounters (collisions) between pairs of binary stars were computer-simulated. The 41,564 collisions were divided into five mass families and, for all cases considered, both binaries initially had circular orbits. The kinetic energy of collision and the impact parameter were chosen at the beginning of each set of about 200 collisions. The direction of the angular momentum for each binary and the phase of the orbit relative to pericenter were picked randomly.

The cross-section for energy exchange for collisions between two binaries composed of identical mass stars was found to be roughly 2-3 times that for a single star colliding with a binary having components with masses equal to that of the single star. Other results cannot be stated so easily, but the energy released by hard (low energy) binary collisions appears to be significant.