Astronomical Infrared Spectrometer. LAWRENCE MERTZ, *Block Associates, Inc.*—The design features and operation of a new infrared spectrometer of the Fourier transform type are presented. The wavelength coverage is from 1.0 to 2.5 μ and the present resolution is about 80 cm^{-1} . Preliminary stellar and planetary spectra have been obtained under unfavorable circumstances, notably with a small 25-cm telescope. The spectra demonstrate a high instrumental sensitivity and freedom from scintillation effects.

Galaxy Formation: the Fragmentation Problem. RICHARD W. MICHIE, *Kitt Peak National Observatory*.—This study of fragmentation uses the moment technique reported previously (*Astron. J.* 70, 327, 1965), and includes the following physics: (a) a nonlinear, nonhomologous fluid flow, (b) the full radiation of energy modified by the self-absorption of the Lyman lines and continua, (c) the (2s-1s) two photon emission, (d) the conduction of heat into or out of the fragment, and (e) the tidal force exerted on the nonspherical fragment by the surrounding gas in the cloud.

In one example, a cloud forms from a small perturbation in an expanding universe and initially shares the cosmic motion. The gas temperature at the start is 10^5 °K. Before the outer parts of the cloud cool very much and begin to collapse it is shown that a perturbation can grow, even if it initially shares the motion of the surrounding (cloud) gas. This example can lead to a cluster of galaxies. A second example illustrates the fragmentation of gas clouds when a cloud is in a state of free fall and is developing a large central concentration. In both examples, as the fragment grows, it loses pressure support and starts to move inward toward the center faster than the surrounding (cloud) gas.

The role of the opacity and the tidal force is to delay the growth of fragments and to help determine the mass spectrum. The nonhomologous collapse is of first importance for the tidal force affects the outer parts of the fragment, and when the fragment develops some central concentration the tidal force becomes much less important. The opacity always delays the collapse by maintaining the internal pressure forces for a long time, and the fragmentation studies made so far indicate the thermal instability is of little or no importance due to the lengthened cooling time scales.

The Influence of Dispersion in Particle Diameters on the Theoretical Form of a Dust Comet. FREEMAN D. MILLER, *University of Michigan*.—The influence of a dispersion in diameters of

particles on the distribution of surface brightness of a comet (consisting only of dust), has been examined for the case in which the diameter frequency varies approximately as the inverse fourth power of the diameter. The three-dimensional fountain model, modified by including a dispersion in the particle ejection velocities was the basis of the analysis. The repulsive force exerted by the sun was assumed proportional to the square of the particle diameter. Light scattering functions for spherical particles were taken from published tables. Despite the rapid decrease of particle frequency with diameter, the larger particles exert a significant influence on the computed surface brightness in the head. In the model considered, truncating the diameter-frequency function at a maximum diameter of 10 μ did not alter this conclusion. The possibility was investigated that differences in particles trajectories due to variation in repulsive force with diameter, might contribute to the bright or sharp leading edges of the tails associated with some comets. A numerical first approximation indicates that if the ratio of the repulsive force to the square of the most probable ejection velocity is sufficiently large (physically within plausible limits) a sharp or bright leading edge may be produced.

The Mass and Dimensions of ϵ Aurigae. STEPHEN C. MORRIS, *Dominion Astrophysical Observatory*.—The mass function for ϵ Aurigae is 3.12 solar masses, and $a_1 \sin i = 1.97 \times 10^9$ km (Morris, *J. Roy. Astron. Soc. Canada* 56, 210, 1962), while the absolute magnitude is -7.5 , as obtained from the strengths of the interstellar lines and from Strand's astrometric orbit (*Astron. J.* 64, 346, 1959). Recent theoretical models indicate a mass for the F component of 15.5 solar masses (Hayashi and Cameron, *Astrophys. J.* 136, 166, 1962) while the radius is 174 solar radii, assuming $T_e = 7200$ °K. Assuming $i = 90^\circ$, the mass function then requires the mass ratio to be 1.1, the F star being more massive. From the eclipse duration, the radius of the invisible component is 850 solar radii in the orbital plane.

A curve of growth analysis of lines of Fe arising in the invisible component has been made for seven phases during and after eclipse. Excitation temperatures from 4740° to 4030 °K are found, with $\log N(\text{Fe I})$ varying from 15.65 to 14.88 (atoms per cm^2 in the line of sight), while $N(\text{Fe II})/N(\text{Fe I})$ is about 2700. Assuming the solar iron to hydrogen ratio, $\log N(\text{H}) = 24.2$, which implies a density of roughly 8×10^{10} atoms/ cm^3 .

As shown by Huang (*Astrophys. J.* 141, 985, 1965) the light curve can be explained if the secondary is in the form of an opaque disk lying in the orbital plane. If there exists a steep opacity gradient in the secondary, a wavelength dependence of the