Thirty-eight Fe I and four Cr I gf values of lines lying between 3150 and 3780 Å have been determined. The results show disagreements on the absolute and relative scales with the oscillator strengths obtained from an open arc by Corliss and Warner (1966, *J. Res. Natl. Bur. Stds.* **70A**, 325), and Corliss and Bozman (1962, *Natl. Bur. Stds. Monogr.* No. 53). The shock tube gf values of Fe and Cr are lower than the arc results by a factor of 8 and 4.4, respectively. A comparison of the arc and shock tube results as a function of upper excitation energy of the lines reveals a discrepancy resembling closely the normalization function imposed on the arc data. It is suggested that this normalization function be changed in the case of Fe I and Cr I for upper excitation potentials exceeding 48 000 cm⁻¹.

In conclusion, the astrophysical implications of these findings are discussed.

Structure of the Radio Nebula W49 and OH Emission. V. A. HUGHES, *Queen's University, Kingston, Ontario*.—The object of the paper is to show the results of some new observations of the radio nebula W49 (3C398) obtained at the wavelength of 2.85 cm with the 150 ft radio telescope at the Algonquin Radio Observatory, and to suggest a mechanism for the formation of OH.

The region is seen to consist of the two sources previously resolved by Mezger, the thermal source A and the nonthermal source B, contours being resolved down to an antenna temperature of 0.1°K. The possibility that source B is a supernova is indicated by the possible presence of a disturbance propagating into source A. Source A can be resolved into at least two dense regions of ionization, A1 and A2, which are coincident in position with the sources of intense anomalous OH emission at 1665 Mc/sec as measured by A. E. E. Rogers *et al.* (*Astrophys. J.* **147**, 1369, 1965). An analysis shows that the ionization density in the two sources is about 10⁴ electrons/cc in agreement with the independent suggestion by Mezger. The particle density in the H I region surrounding the source is probably of the same value.

The formation of OH in the excited ($A^2\Sigma$) state as a two-body process has been observed in the laboratory with the emission of 3064 Å radiation by Spindler *et al.* (Spindler, G., Ticktin, S., and Schiff, H. I., *Nature* **214**, 1006, 1967) at a rate given by $I = K[H][O]$ where the value for the rate factor K is approximately 10⁻²⁰ molecules cm⁻³ sec⁻¹ at room temperature. It is suggested that this process is taking place in the pressure wave ahead of a D -type ionization front which forms the boundary of the intense H II regions. An increase in density of 40 times is possible in the front which leads to the formation of OH at the rate of 3×10^{-12}

molecules cm⁻³ sec⁻¹, assuming the ratio of H to O of 10³. For a front velocity of 10 km/sec and a distance traveled by the front of 1 pc, the density of OH molecules will be 18 cm⁻³. Since the OH is formed in an excited state, this could provide the pumping mechanism for laser action, which requires an excess population in the upper state of 10⁻⁵ cm⁻³. The two-body process is amenable to observation since it produces optical radiation at the wavelength of 3064 Å.

Numerical Experiments on Free Precession in the Galactic System. K. A. INNANEN, *York University, Toronto, Canada*.—Lynden-Bell (*Monthly Notices Roy. Astron. Soc.* **129**, 229, 1965) has recently shown that, to the first order, the observed bending of the galactic plane may be caused by a small deviation between the galactic symmetry and angular momentum axes. Numerical integration of orbits of particles with a first-order Lynden-Bell perturbation in a mass model of the galactic system (Innanen, Z., *Astrophys.* **64**, 158, 1966; **64**, 445, 1966) confirm this conclusion and show that such particles will begin to oscillate strongly in the radial direction, as well. This may, therefore, be an efficient mechanism in disrupting circular motion in the outer parts of the galactic system.

Solar Flare Movies in 24 Different Wavelengths about H α . THOMAS J. JANSSENS AND ERNEST H. ROGERS, *Aerospace Corporation*.—High-resolution photographs of solar flares have been taken in rapid fashion at many wavelengths in the vicinity of H α , typically, 24 wavelengths over a range of 4 Å. When these photographs are viewed as a movie, one experiences a rhythmic scanning through various depths of the solar atmosphere. In addition, Doppler shifts, broadenings, and brightenings of spectral lines of various solar features can be seen both in emission and absorption.

The correlation between photospheric and chromospheric feature becomes strikingly apparent. It is possible to see surges and ejecta as they are Doppler-shifted, to see brightenings as their line profile broadens, and one is able to distinguish between the shifting and broadening. In flare brightenings, it becomes clear where the hottest regions are since they are the bright areas which persist the longest into the wings of the line. Some magnetic information can be inferred from the positions of umbra, penumbra, the H α network, plages, and filaments.

This technique was first used in March 1967 at the Aerospace Solar Observatory, and at this writing two class 1 flares have been photographed. A solar flare case history and movie of the largest and most interesting flare observed by the time of the meeting is presented.