An application of the program is made to obtain a self-consistent solution for neutral helium in the shell surrounding a star. A five-level model atom is employed in an atmosphere of constant $T_e=10\,000°$, $N(He)=10^{11}$ cm^{-3}, and $N_e=10^{12}$ cm^{-3} which is excited by a B star.

Evidence for Nitrogen Dioxide in the Martian Atmosphere. C. C. Kiess, C. H. Corliss, and H. K. Kiess, *Georgetown College Observatory and National Bureau of Standards.*—During the oppositions of Mars in 1956 and 1960–61 we obtained several spectrograms of the planet and the moon, with our concave-grating spectrograph giving a dispersion of 5 Å/mm. Spectra of the moon were recorded in juxtaposition with those of Mars when the moon, on the same date, was as near as possible in altitude to that of Mars.

Microphotometer tracings of these spectra show not only the decline of the Martian spectrum toward shorter wavelengths relative to that of the moon, but also numerous dips and depressions in the spectrum of Mars that do not occur in the lunar spectrum. These features suggested absorptions by an unknown atmospheric constituent of the planet. Comparisons with published laboratory data showed an almost one-to-one correspondence between the Martian features and those of nitrogen peroxide. This induced us to observe the absorption spectrum of this gas from the near infrared to the vicinity of 3600 Å. Nearly all the so-called bands revealed in this investigation from $H\alpha$ to the H and K lines agree in wavelength with similar absorptions in Mars. Of particular interest is the spectrogram of 12 October 1956 taken at a time when other observers noted a yellow veil over the planet. About 100 Martian features between $H\alpha$ and 6150 Å agree in wavelength with absorptions measured on a laboratory spectrum of NO_2.

Secular Perturbations of Asteroids with High Inclination and Eccentricity. Yoshihide Kozai, *Smithsonian Astrophysical Observatory.*—Secular perturbations of asteroids with high inclination and eccentricity moving under the attraction of the sun and Jupiter are studied on the assumption that Jupiter's orbit is circular. After short-periodic terms in the Hamiltonian are eliminated, the degree of freedom for the canonical equations of motion can be reduced to 1.

Since there is an energy integral, the equations can be solved by quadrature. When the ratio of the semimajor axes of the asteroid and Jupiter takes a very small value, the solutions are expressed by elliptic functions.

When the z component of the angular momentum (that is, Delaunay's H) of the asteroid is smaller than a certain limiting value, there are both a stationary solution and solutions corresponding to libration cases. The limiting value of H increases as the ratio of the semimajor axes increases, i.e., the corresponding limiting inclination drops from 39°.2 to 1°.8 as the ratio of the axes increases from 0.0 to 0.95.

Study of Degeneracy in Very Light Stars. Shiv S. Kumar (National Academy of Sciences–National Research Council, Postdoctoral Research Associate with NASA), *Institute for Space Studies.*—Convective models have been constructed for stars of mass $M<0.1M_\odot$. For a given mass, the internal structure of the star is computed at several radii, taking into account nonrelativistic degeneracy of the stellar material. It is found that for these stars the central temperature has a maximum value at one particular radius and this value decreases when the radius is greater or smaller. For example, for a Population I star of mass $0.05M_\odot$ the maximum temperature of two million degrees occurs at a radius of $0.12R_\odot$, and the temperature decreases if we increase or decrease the radius. For Population I stars with mass less than $0.05M_\odot$ the central temperatures and densities are too low for energy production by the proton–proton cycle and even for a star of mass $0.07M_\odot$ this process may not produce sufficient energy. Application of these models is made to contracting stars and it is found that Population I stars of mass less than $0.05M_\odot$ become degenerate objects and that they do not reach the main-sequence stage. The limiting mass for such an evolution may be as high as $0.07M_\odot$. For a star of mass $0.05M_\odot$, the time scale for contraction to the stage of maximum central temperature is estimated to be approximately one billion years, which is small as compared with the age of the galaxy. After this stage the star begins to cool slowly and evolves towards a completely degenerate configuration. Thus it becomes a "black" dwarf without ever going through normal stellar evolution.

Steady-State Atomic Populations in Stellar Atmospheres. Myron Lecar, *Yale University Observatory and Institute for Space Studies.*—A collection of computer programs has been developed to compute steady-state atomic populations in stellar atmospheres. First, the temperature distribution satisfying radiative equilibrium is calculated, assuming LTE. Then, the resulting radiation fields are used to compute the non-LTE steady-state populations. The calculation is applied to the atmosphere of an A0 star, assuming a composition of pure hydrogen.