from the viewpoint of the form of the Hamiltonian. He did not try to solve the equations of motion explicitly.

This paper shows the development of a higher-order theory of the motion of close satellites in the vicinity of critical inclination, provided that the earth potential is plane symmetrical. The equations of secular motion, which I have solved here, are very similar to Izsak's. The solution includes not only the case of small eccentricity, but also the case of moderate eccentricity, with the terms corresponding up to the order of $(J_2)^3$, counting the square of the eccentricity as the order of J_2 in the former case, in the original equations of motion. For the case of moderate eccentricity, the expression of the solution involves not only the elliptic functions of Jacobi, but also the elliptic integral of the second kind. On the other hand, for the case of small eccentricity, the expression of the solutions involves only the elliptic functions.

It is also shown that in order to get higher approximation beyond the third order, especially for the case of small eccentricity, the solutions must involve the elliptic integral of the third kind.

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Beta Decay Inhibition in Stellar Interiors.

JOHN H. BAHCALL AND VERN L. PETERSON, *Indiana University*.—If the density in a stellar interior is sufficiently high, the Pauli exclusion principle must be taken into account when dealing with beta decay rates. The decay rate depends upon temperature, electron density (or, more conveniently, the Fermi energy E_f) and the maximum energy the electron can receive during the decay of a particular isotope (called the beta energy E_β). The dependence of the decay rate upon the atomic number is small and may be neglected, at least for allowed and first-forbidden nonunique decays. If $E_f \gtrsim E_\beta > kT$, the decay inhibition is essentially complete, especially for temperatures which are in the low end of our range of interest ($T \sim 10^8$ to 10^9 °K). Curves illustrating the dependence of the decay rate on E_f , E_β , and kT are given.

During the red-giant stage of a star, when the slow neutron-capture process (s process) is supposedly taking place, the above considerations are important. The abundances of the s -process elements in the core of the red giant depend upon beta decay rates, and if certain decays are inhibited the abundances will be affected. As a result it may now be possible to assign to the s process certain isotopes (e.g., Er^{170}) which are now assigned to the r process.

Mass Distribution in Messier 33. JOHN C. BRANDT, *University of California, Berkeley*.—The optical rotation curve for M33 has been redetermined using $H\alpha$ spectrograms taken with the Mt. Wilson B spectrograph. This rotation curve extends to 30' from the center of M33, but it can be continued to 60' from the center with the aid of the radio observations. The shape of the rotation curve is rather similar to that of M31; hence, the relative mass and density distributions should be similar. For an assumed distance of 630 kpc, the mass is approximately $2 \times 10^{10} M_\odot$.

High-Luminosity, Fully Convective Contracting Sun. II.

A. G. W. CAMERON AND D. EZER, *NASA Institute for Space Studies, New York*.—Models described in the accompanying paper (p. 575) have many interesting properties. For $R/R_\odot > 57$, the absolute value of the gravitational potential energy is less than the sum of the thermal, ionization, and dissociation energies of the material. Hence such models are purely formal and would be in the region of instability against gravitational collapse. Deuterium burning was not taken explicitly into account, but it would occur at approximately $R/R_\odot = 10$. If the primitive sun had the terrestrial ratio of deuterium to hydrogen, then with $L/L_\odot \sim 28$ the contraction would be halted for only about 3×10^5 yr. During the further contraction the bottom of the outer convection zone goes through a temperature maximum of 3.5×10^6 °K. This would lead to considerable depletion of lithium throughout the sun. The Helmholtz-Kelvin contraction time from $R/R_\odot = 57$ to $R/R_\odot = 1.7$ is only 10^6 yr (not including deuterium burning). The sun should reach the main sequence in about 2×10^6 yr. These results were calculated for the convective mixing length equal to the pressure scale height. It is probable that the mixing length should be greater than this, and in such a case we find the luminosity to be increased. Hence these contraction times are probably upper limits. From these results it is clear that we must expect the high-luminosity stages of the contraction to have a considerable influence on conditions in a primitive solar nebula from which planets have presumably condensed, but the sun may well have reached the main sequence long before the development of the planets was completed.

Statistical Spectrum of Jupiter at Decameter Wavelengths. T. D. CARR, A. G. SMITH, *University of Florida*, C. S. HIGGINS, *CSIRO, Sydney, Australia*, AND H. BOLLHAGEN AND J. MAY, *Maipú Radioastronomical Observatory, University of Chile*,