the greater star. Theoretical light curves were computed for different coefficients of limb darkening and ratios of radii. It was found that $x=0.4$ and $k=0.45$ achieves the best agreement with the observations. The semimajor axis of the greater star is found to be $a_g=0.54$ and the inclination 78° .

Theoretical Evaluation of Atmospheric Drag Effects in the Motion of an Artificial Satellite, Part II. DIRK BROUWER AND GEN-ICHIRO HORI, *Yale University Observatory, New Haven, Connecticut*.—In a previous paper, presented at the Pittsburg meeting, it was shown that the solution of the motion of an artificial satellite with atmospheric drag under the gravitational field of the oblate earth is reduced to that of the equations

$$\frac{dL''_k}{dt} = -C_D A V_{pk}'' \exp(-\alpha r),$$

$$\frac{dl''_k}{dt} = \frac{\partial F^{**}}{\partial L''_k} + C_D A V_{ak}'' \exp(-\alpha r).$$

The quantities $V_{pk}'' \exp(-\alpha r)$, $V_{ak}'' \exp(-\alpha r)$ are evaluated from the drag-free theory (Brouwer, *Astron. J.* **64**, 378, 1959). The third and the fourth harmonics are included as well as the second. The method of canonical transformation is extensively applied in this evaluation. Short-period terms of the drag-free problem produce secular and long-period terms. This is one important result of the coupling effect between drag and oblateness.

The solution contains secular, mixed secular, long-period, and short-period terms. As for the variables L_j'' and l_j'' ($j \neq 1$), the solution is obtained up to the orders $C_D k_2$, k_2^2 for secular and mixed secular terms; up to the order C_D for periodic terms. For the variables l_1'' , long-period terms are complete to the order C_D/k_2 . The solution is complete to the order e^4 for the variables L_j , l_3'' and $l_1''+l_2''$. The physical nature of the solution is discussed.

405-Mc Observations of the Galactic Center. B. F. BURKE AND J. W. FIROR, *Carnegie Institution of Washington, Department of Terrestrial Magnetism*.—It is known from 3.8-cm observations that the radio continuum brightness distribution in the vicinity of the galactic center is complex. The most intense radiation at that wavelength comes from a source of small angular diameter, perhaps 3 or 4 minutes of arc, superimposed on a broader, somewhat less intense emission region about 30 minutes of arc in diameter. These will be referred to as sources A and B, respectively. Along the galactic plane, and symmetrically disposed about $\frac{1}{2}$ deg to either side of these central sources, are two discrete

sources (C and D) of approximately equal brightness. The entire system of sources is superimposed on a fainter background, detectable over a region several degrees in diameter. We have made observations of this region at 405 Mc, with a fan-beam antenna having an east-west resolution of 12 minutes of arc. From these observations several deductions can be made.

1. The two sources C and D, which lie close to the hydrogen ring described by Rougoor and Oort, could not be seen, and must be thermal in nature.

2. The right ascension of the peak of the central complex at 405 Mc, $17^h42^m41^s$ (1950.0), agrees with the 3.8-cm position of source B within 1 minute of arc. The observed intensity requires that at least part of the central region A and B emit nonthermally. The observations are consistent with the interferometer measurements of the Meudon group at 1420 Mc, who found that source A apparently is thermal, while source B is nonthermal.

3. At 405 Mc, the separation of the central complex A and B from the disk component of the galactic background cannot be made unambiguously, implying that most of the nonthermal radiation from the central regions may well originate, not in a discrete central source, but in a central concentration of the galactic nonthermal background.

Three Southern Spectroscopic Binaries. WILLIAM BUSCOMBE AND PAMELA M. MORRIS, *Mount Stromlo Observatory, Canberra, Australia*.—Radial velocities have been measured from three-prism spectrograms (36 Å/mm at $H\gamma$) exposed at the Casse-

TABLE I.

HD	114911	184035	217792
Name	η Mus	BS 7422	π PsA
Vis. mag.	4.8	5.9	5.1
Spectrum	B8 V	A3 III	F0 IV
Prev. obs.	6	0	15
New obs.	11	12	26
P , days	20.0052	4.625	356.567
γ , km/sec	-8.1	+11.9	-7.3
K , km/sec	56.5	72.5	21.5
e	0.12	0.09	0.70
ω	120°	315°	10°
T -JD 2400000	20606.722	36702.433	34968.266
$10^{-6} a \sin i$, km	15.4	4.6	75.3
$f(m)$, solar masses	0.36	0.18	0.13

grain focus of the 30-inch reflector, during the years 1955–60. Combined with similar data for η Mus and π PsA obtained 40 years ago by the Lick Observatory in Santiago, and also measures for π PsA from the Cape, these make possible the determination of orbits. The duplicity of HD 184035 was first discovered here in 1959. Irwin's tables were used in deriving the preliminary orbits. Details of observations and orbital parameters are given in Table I.