noon. The results provide abundant illustrations of the two types of variability which have for several years been recognized as characteristic of solar radiation in the meter range of wave lengths: (1) a relatively slow variation represented by a change in "base level," and (2) superposed abrupt surges, or "bursts," of radiation.

The variation of midday base levels at 205 megacycles has been compared with similar data at 2800 megacycles as determined by A. E. Covington. Two conclusions may be drawn: (1) The range of variation is much greater at the lower frequency, and (2) A correlation of base level with American sunspot number, similar to that already demonstrated by Covington for radiation at 2800 megacycles, occurs at 205 megacycles, but is less strongly marked at the lower frequency.

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Strand, K. Aa. The astrometric orbit of Procyon.

From a series of 105 plates taken with the 40-inch Yerkes refractor between 1916 and 1949 and a series of 85 plates taken with the 26-inch McCormick refractor between 1915 and 1942 the astrometric orbit of the brighter component of Procyon and its parallax have been derived. Since the photographic material does not cover the entire period of 40.3 years the micrometer measures made by Aitken and Barnard between 1897 and 1913 were used in establishing the period.

The photographic material gives the relative parallax 0.293 ± 0.006 (p.e.) in close agreement with the value given by Schlesinger's catalogue, and the value 1.194 ± 0.010 for the semi-major axis of the astrometric orbit. Utilizing the series of relative distances between the components observed by Barnard and Aitken the semi-major axis is 4.520 . The adopted value 0.295 for the absolute parallax gives the masses $1.63\odot$ and $.59\odot$ for the visual components. The mass for the brighter component is of the expected order of value for an F5 IV star with a bolometric magnitude 2.73.

For an independent check on the derived orbital motion and the parallax a series of 17 spectrograms taken at the coudé focus of the 100-inch reflector between 1926 and 1946 have been measured but as yet not fully reduced.

*Dearborn Observatory,
Evanston, Ill.*

Thomas, Richard N. Hydrogen self-absorption in the solar chromosphere.

Previous attempts to calculate hydrogen self-absorption in the solar flash-spectrum have used the earlier members of the Balmer series and essentially constructed emission curves-of-growth. Work on the Balmer decrement has been directed toward a solution for the b_n values, ignoring effects of self-absorption. It now seems that, for at least the higher series members, the Balmer decrement depends very little on the b_n and essentially entirely upon the differential self-absorption. On this basis the self-absorption has been evaluated; and the number of hydrogen atoms, along a one square centimeter column in the line of sight, in the second level obtained. The value is $1.2 \cdot 10^{16}$ atoms/cm² at the eclipse height 670 km. The change of Balmer decrement with height gives the gradient of the population in this level. Combined with the equation of hydrostatic equilibrium, this gradient permits a rough estimate of the electron temperature gradient. The temperature gradient seems to be between 1 and 5×10^{-4} degrees/cm at the height 1000 km.

*Institute for Advanced Study,
Princeton, N. J.*

Williamson, Ralph E. The opacity of the galaxy for radiofrequency radiation.

The apparent width of the galaxy (measured in degrees of galactic latitude) in radiofrequency radiation varies with frequency in a manner incompatible with the hypothesis that free-free transitions of ionized hydrogen are responsible for the radiation. The apparent angular width can be used to calculate an opacity for the galaxy in a direction perpendicular to the galactic plane, on the basis of simple radiation theory. From published observations ranging in frequency from 20 Mc/sec to 480 Mc/sec, it is found that the opacity varies with the inverse 0.7 power of the frequency, with fair accuracy. For the free-free transitions, the required power would be the inverse square.

*David Dunlap Observatory,
Richmond Hill, Ontario.*

Woolsey, E. G. Declination cameras for the meridian circle.

The Ottawa meridian circle is being modified to include cameras to photograph the division marks on the circle. They have been developed to make use of the mountings and lenses of the microscopes formerly mounted on the east pier.

The design of the cameras is based on that at present in use on the six-inch meridian circle of the U. S. Naval Observatory in Washington.

Two minor changes have been made in mechanical parts and it is hoped that these will make mounting easier and operation more satisfactory for cold weather observing. Firstly, the power for advancing the film is transferred from the motor to the camera by having a worm and gear attached permanently to the camera and by connecting it to the motor by a four-inch flexible cable which fits over a square shaft. This makes mounting easy but necessitates independent control for each motor; secondly, the shutter is opened by a small three-phase motor. Only one phase is connected and when 30 volts D.C. is applied the armature is pulled through an angle of about 20°. The motor was chosen in preference to a solenoid because it is expected to operate better in cold weather.

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Ottawa, Canada.*

Wright, K. O. Intensities of titanium and vanadium lines in the spectra of K-type stars.

Intensities of 135 *V I* lines and 80 *Ti I* lines for which King¹ has published laboratory *gf*-values have been measured in the spectra of α Bootis (Arcturus), *gKo* and γ Draconis, *gK5*. The spectra covered the region $\lambda\lambda 4700$ –6700 and were obtained with a Littrow mounting of a Wood grating which gives a dispersion of 7.0 Å/mm. Curves of growth were constructed by plotting

Atom	Configuration	v km/sec	T_{exc} °K	Γ $\times \gamma_{\text{cl}}$
α Bootis				
<i>V I</i>	3d ³ 4s ²	3.8	3525	3
<i>V I</i>	3d ⁴ 4s	2.4	3475	2
<i>Ti I</i>	—	3.8	3300	3
γ Draconis				
<i>V I</i>	3d ³ 4s ²	6.0	3400	5
<i>V I</i>	3d ⁴ 4s	3.2	4050	3
<i>Ti I</i>	—	5.4	3000	4

v = Turbulent velocity; T_{exc} = Excitation temperature; Γ = Damping factor.

$\log W/\lambda$ against $\log gf\lambda$ for each excitation potential and were compared with theoretical curves based on the Milne-Eddington model computed by Wrubel.² The table gives the results obtained.

1. *Ap. J.* **105**, 376, 1947; **87**, 24, 1938.

2. *Ap. J.* **109**, 66, 1949.

*Dominion Astrophysical Observatory,
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TITLES OF ADDITIONAL PAPERS PRESENTED AT THE MEETING IN OTTAWA, CANADA

- Olivier, Charles P. Some conclusions from over 3000 observations of meteors made with telescopes. Symposium I.
- Adel, Arthur. Non-Rayleigh scattering of the infra-red solar spectrum by the earth's atmosphere.
- Clemence, G. M. First-order theory of Mars.
- Cook, Allan F., II. On the mathematical characteristics of sunspot variations.
- Covington, A. E., and W. J. Medd. Solar noise observations on 10.7 centimeters and 1.52 meters.
- Eggen, Olin J. Absolute magnitudes of the nearest stars of luminosity classes IV and V.
- Erro, L. E. The galactic research program of the National Astrophysical Observatory of Mexico.
- Gaposchkin, Sergei. Some variables in the vicinity of the galactic nucleus.
- Herbig, George H. The spectrum of R Coronae Borealis at the 1948–49 minimum.
- Kron, Gerald E., and Katherine G. Kron. The atmosphere of a Wolf-Rayet star.
- McMath, Robert R., A. Keith Pierce, Orren C. Mohler, and Leo Goldberg. Observations of solar limb darkening at the McMath-Hulbert Observatory.
- Mohler, Orren C., and A. Keith Pierce. The solar spectrum between 3.0 and 3.6 μ .
- Reber, Grote. Solar radio waves.
- Underhill, Anne B. A high-temperature model atmosphere.
- van de Kamp, Peter. Recent astrometric study of nearby stars.
- Van Woerkom, A. J. J. Discussion of the observations of Jupiter's fifth satellite (1893–1921).
- Welch, H. L. The extent of the calcium chromosphere in the K-type component of Aurigae.
- Wrubel, Marshal H. The transfer of radiation in a spherical atmosphere of electrons.

Omitted from List of Additional Papers in
A. J. **54**, 142, 1949:

Land, Gustav. Systematic effects in the probable errors of the Yale parallaxes.

POSITIONS AND PRELIMINARY ORBIT OF NEREID, NEPTUNE'S SECOND SATELLITE

BY D. HARRIS AND G. VAN BIESBROECK

Since Dr. G. P. Kuiper discovered this object on May 1 on plates taken at the prime focus of the 82-inch reflector of the McDonald Observatory¹ two more epochs May 29 and June 18 were covered until the planet was too far west for further records. As a basis for determining the orbit the plates were measured at the Yerkes

Observatory. There is such an enormous difference in brightness between the satellite and catalogue stars, even those of the astrographic zones, that it proved impossible accurately to connect the former to the latter. As an intermediary step for each plate the positions of three faint comparison-stars of 15th or 16th magnitude in the