have been re-solved using equations of the following form:

$$\Delta\alpha = (-.557 a \sin \Omega - 15 b \cos \Omega)\Delta N \\ + (15 b \sin \Omega - .557 a \cos \Omega)N\Delta\theta,$$

$$\Delta\delta = (-.037 a' \sin \Omega - b' \cos \Omega)\Delta N \\ + (b' \sin \Omega - .037 a' \cos \Omega)N\Delta\theta.$$

where $\Delta\theta$ represents the phase angle of any lag; a , a' , b and b' are the Besselian star constants; and N is 9^m.210. The results are given in the table. The residuals indicate considerable uncertainty in the results, but it seems important to present them. The large residuals are due, partly to poor distribution over the period of the moon's node, and partly to large accidental range in the observations. A later Washington series is to be examined.

The quantity $\Delta\theta = +0^{\circ}.11$, if real, means a lag of two days in the principal term of the nutation.

These observations are satisfied by the nutation:

$$\Delta\alpha = +9''.202 A + ''018 B, \\ \Delta\delta = +9''.202 A' + ''018 B',$$

where A , B , A' , and B' are the coefficients of ΔN and of $N\Delta\theta$ given above.

1. *M. N.* 108, 209, 1948.
2. *A. J.* 50, 125, 1943.

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Nassau, J. J. and D. A. MacRae. A study of the galactic structure in a clear region in Cygnus.

The present investigation is a part of a general program, at the Observatory, dealing in a broad sense with the study of the fluctuations of the stellar luminosity function. The field under investigation has an area of 11 square degrees with a center at R.A. = 20^h0^m and Dec. = 38^o0'. It is relatively free from space absorption with the exception of about one square degree near its southern boundary.

The photographic and photo-red magnitudes and spectra of 1230 stars were determined. Beginning with Fo and later, all stars with few exceptions were classified either giants or dwarfs up to the limiting photographic magnitude of 12.15. For stars brighter than 11.0 four luminosity classes were used.

The mean value of interstellar absorption in the clear region was derived from 683 stars and

found equal to 0.53 mag. per kiloparsec. The color excess of the stars in the obscured region seems to indicate that an interstellar cloud sets in at about 500 parsecs with a maximum value of about 0.6 mag. over and above the general absorption of the region. This result however is provisional as our present data are limited to 75 stars only.

The division of the stars with giants and dwarfs in each spectral group indicates a rapid decrease in the ratio of dwarfs to giants from Fo-F5 group to G8-K3 group. In the former group we have about 90 per cent dwarfs while in the latter about 5 per cent.

Space densities, corrected for absorption, for all the spectral groups were computed for the stars in the relatively clear region. The densities have been used to compute a luminosity function at distances of 100, 200, 400 and 600 parsecs and show no significant differences between the four regions. Likewise no significant difference exists where our results are compared with the standard van Rhijn luminosity function, with one exception at absolute magnitude between -1.5 and +1.0. Here the maximum excess in our case in the log $\varphi(M)$ is 0.3.

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O'Connell, D. J. K., S. J. RY Scuti, an eclipsing binary of the V444 Cygni type.

A photographic light curve of RY Scuti was obtained from estimates on 774 plates taken at Lembang and Riverview observatories. The writer was at the time unaware of the work done on this variable by S. Gaposchkin¹ and Popper.² The period agrees well with Gaposchkin's. The ranges at primary and secondary minimum are 0.52 and 0.47 mag. respectively. The ellipticity constant, z , and the reflection constant, b , were determined from the light curve as 0.31 and 0.01 respectively.

Primary minimum is much wider than secondary, the ratio of the widths being 1.76. Secondary minimum is 0^d.11 earlier than the midpoint between two primary minima. It would follow that the eccentricity of the orbit is 0.27 and the longitude of periastron 268^o. On the other hand, Popper's radial velocity measures are altogether inconsistent with such a large orbital eccentricity. These apparently conflicting photometric and spectroscopic observations can be reconciled, if one assumes that the broadening of primary minimum is caused by an "atmospheric eclipse"

of the kind discussed by Kopal³ for V444 Cygni. This means that the star which is in front at primary minimum has an extended and partly opaque atmosphere.

1. *Ann. Harv. Coll. Obs.* **105**, 509, 1937; *Bull. Astr. Obs. Harv.* **917**, 14, 1943.
2. *Ap. J.* **97**, 406, 1943.
3. *Ap. J.* **104**, 160, 1946.

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Omer, Guy C., Jr. A relativistic model for a cluster of nebulae.

A numerical relativistic model based upon the Coma cluster of nebulae has been constructed. Following F. Zwicky, it has been assumed that the Coma cluster can be represented by an Emden isothermal distribution which is bounded at $r_1 = 85$. The cluster is considered as forming the central portion of a cosmological model and as extending out to a present radius of 2×10^6 light years. Beyond this boundary the model is taken as being identical with the cosmological model which was previously presented by the author.¹ Thus the model is subject to the assumptions of spherical symmetry, co-moving coordinates, and zero-pressure. These assumptions appear to be reasonable for the Coma cluster at the present time. The choice of a particular cosmological model outside of the cluster specifies a cosmological constant of 8.78×10^{-19} (lt. yrs.)⁻² for the entire model and a time-scale of 3.64×10^9 yrs. at the boundary of the cluster.

Since the dimensions of the cluster are small as compared to the rest of the model it is reasonable to require that the time-scale everywhere within the cluster must be equal to the time-scale at its boundary. This allows the local radius of curvature to be calculated for points within the cluster. Approximate calculations were made by assuming that certain selected interior points were contained within Friedmann zones. Since all of the relativistic parameters are now specified throughout the model, its local behavior can be determined. It was found that there was a change in local behavior at a present radius of 2.5×10^5 lt. yrs. Beyond this radius the cluster expands with the rest of space, although at a slower rate. The local behavior of this part of the cluster is similar to the expansion of an M_1 model in the homogeneous cosmologies. The gravitational field within this radius is sufficiently high so that the nucleus of the cluster does not expand monotonically, but oscillates instead. This local be-

havior is similar to an O_1 model in the homogeneous cosmologies. The nucleus, therefore, should be a permanent feature of the cluster.

The physical state of the model at the earlier epoch of 10^9 yrs. after the beginning of the expansion was calculated. The local density within the cluster was found to vary from the center to the boundary by a ratio of only 2 to 1. This may be compared to the present assumed ratio of 400 to 1. Further extrapolation to earlier epochs indicates that the cluster may have been formed from a small initial fluctuation in the local density at the beginning of the expansion. A similar calculation for the later epoch of 7.5×10^9 yrs. after the beginning of the expansion shows the persistence of the nucleus and the continued expansion of the remainder of the cluster towards an eventual empty end-state.

1. *A. J.* **54**, 46, 1948.

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Omer, Guy C., Jr. Local behavior of spherically symmetric relativistic solutions.

The fundamental non-linear partial differential equation of spherically symmetric, zero-pressure, nonhomogeneous, relativistic cosmology has been solved in terms of Weierstrassian elliptic functions. The allowed range of the parametric variable in this solution can be delimited by the physical requirement that all measures of length and time within the model must be real. This allows the determination of the local behavior of a nonhomogeneous model in the immediate neighborhood of any given point. H. P. Robertson's convenient notation for the behavior of homogeneous models can be readily generalized for the nonhomogeneous models to describe the local behavior within the neighborhood of any given point. Robertson has also given a two-dimensional plot which specifies the behavior of any particular homogeneous model. This geometrical representation can also be generalized into a three-dimensional plot which specifies the local behavior of nonhomogeneous models.

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Pearce, J. A. HD 215835—a new massive eclipsing system.

This ninth magnitude star in the galactic cluster NGC 7380 was independently discovered to be a spectrographic binary by Trumpler and the writer. Thirty-six single-prism spectra having