numbering machine, such as the one manufactured by W. A. Force and Company, Chicago. The printed rules serve as guides, so that the finished tag measures $\frac{1}{4}'' \times \frac{7}{8}''$. These impressed numbers are then inked by hand with Higgins waterproof drawing ink, to increase the legibility of the numbers, and dried. The numbering machine perforates the strip opposite each number, and the numbered strips next have the strings attached. The individual tags are then cut from this strip as wanted.

The late Dr. Carl H. Eigenmann seems to have been the first to use this special paper for numbering museum specimens. Before deciding on its use in the Field Museum, Mr. Alfred C. Weed subjected sample tags to severe tests, such as boiling and shaking with stones; it was adopted by Mr. Weed and myself for the collections in our charge in 1922. It has since been adopted by the Museum of Comparative Zoology, the Museum of Vertebrate Zoology of the University of California, and the Museum of Zoology of the University of Oklahoma. No disadvantage has appeared during the nine years of our experience with this material.

The small, light, legible tags are of course especially suitable for small mammal skulls, to which they may remain attached while boiling.

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SPECIAL ARTICLES

THE DISTRIBUTION OF EXTRA-GALACTIC NEBULAE

THE paper gives the results of an analysis of counts of nebulae on E-40 plates made by the writer with the 100-inch and 60-inch reflectors at Mount Wilson. About 20,000 nebulae were counted on 900 plates. Six hundred of the plates represent hour exposures on selected areas uniformly distributed in galactic coordinates over three-fourths of the sky (north of Dec. $-30°$). The remaining 300 plates, with exposures ranging from 20 min. to 3 hours, were for the most part centered on individual objects.

REDUCTIONS

The counts were reduced to a homogeneous system by corrections for quality (the better the definition the greater the number of small nebulae which could be distinguished from stars, etc.) and later for zenith distance. Plates with the two telescopes were first analyzed independently but were later combined by applying a mean factor to the 60-inch results. Corrections were also derived for reducing the actual counts to the number of nebulae per square degree (coma factor and area factor). These, however, were not used in the intercomparison of plates. Tabulation of the data and the detailed analysis will appear in a contribution from the Mt. Wilson observatory.

RESULTS

Results of the analysis are as follows:

(A) No nebulae are found in very low galactic latitudes. The "zone of avoidance" is irregular and sinuous, the width ranging from 10° to 40°. It appears to represent the distribution of known obscuring clouds—a relatively narrow belt symmetrical to the galactic plane from which run out the great clouds in Taurus, Cassiopeia, Ophiuchus, etc. The inclined belt of bright B stars and diffuse nebulosity, reaching its highest latitudes in Taurus and Ophiuchus, respectively, is a conspicuous feature.

(B) The zone of avoidance is bordered by partial obscuration which extends out to latitudes $\pm 40°$ in the general direction of the center of the galactic system longitude 330° to 340°) but is very limited in the opposite direction except for the known obscuration below the Taurus region (long. 140° lat. $-35°$ to $-40°$, balanced by the obscuring cloud at long. 330° lat. $+35°$).

(C) For latitudes greater than $\pm 40°$ (and in lower latitude in the direction of the anti-center) the distribution of the nebulae is approximately uniform, with occasional clusters scattered at wide intervals. The mean log N for an exposure of one hour with the 100-inch, 5×7 plate, definition excellent, zenith distance zero, is 1.74, corresponding to 2.375 for a square degree. This may be compared with $\log N = 2.036$ per square degree for the 60-inch under similar conditions. The frequency distribution of the counts approximates an error curve with a probable error of the order of 0.15 in log N for a single plate. The extreme range is about 1.0 in log N, but this includes all accidental errors as well as actual deviations.

(D) In the region of normal distribution and for exposures ranging from 20 min. to 3 hours, the counts are correlated with the exposure times, and the correlation closely approximates that to be expected on the assumption that the nebulae are uniformly distributed in depth (tripling the exposure increases the limit of the plate one magnitude and quadruples the number of nebulae). The scatter about the correlation curve $\log N = 1.26 \log E - 0.50$ diminishes as the exposures increase. Data from other sources indicate that counts of brighter nebulae are fairly consistent with this correlation. Appreciable absorption of light in extra-galactic space appears to be inadmissible.

(E) The limiting magnitude for the counts on exposures of one hour with the 100-inch is estimated as 19.8, hence the number of nebulae per square degree is given by the relation

$$\log N_{sd} = 0.6\, m_{pg} - 9.5$$

This, combined with the value -13.8 for the mean absolute photographic magnitude of nebulae, leads to a mean density of the order of one nebulae per 6×10^{16} cubic parsecs. A provisional value for the mean mass of nebulae, 5×10^{8} times the mass of the sun, suggests 5×10^{-31} gm/c.c. as the order of the mean density of nebular material in the observable region of space.

(F) The scanty data available suggest that, in the regions of normal distribution, one cluster of nebulae which would be recognized as such on exposures of one hour, may be expected per 30 square degrees. This frequency is tentative and depends largely upon the criteria selected for defining a cluster.

The distribution of nebulae appears to be approximately uniform out to the limits of the largest telescope available, except in so far as it is affected by partial or complete obscuration by diffuse material within the galactic system. Great clouds of the latter material are known to exist; in fact, the pattern of obscuration along the Milky Way seems to account for many or most of the "star clouds." Evidence from the nebulae concerning a uniformly diffused substratum within our own system is contradictory. In favor of the hypothesis is the fact that, in the general direction of the center, the counts of nebulae are affected out to latitudes $\pm 40°$, the occasional late type spirals in low latitudes with abnormally faint surface brightness; and the color-excess exhibited by members of the Perseus cluster of nebulae at lat. $-13°$. For these facts a diffuse substratum offers a possible although not a necessary explanation. Against the hypothesis are the approximately normal colors among nebulae in low latitudes and longitudes 10° to 50°, the normal surface brightness of late type spirals in the same region at latitudes as small as 8°, and the fact that for the 8 nebulae within 20° of the galactic plane whose spectra are available, the absolute magnitudes corresponding to distances indicated by the red shifts average brighter than normal. Extensive observations will be required for a definite conclusion. Obscuring clouds are familiar, but a diffuse substratum can be investigated only when the effects of the clouds can be ascertained and eliminated.

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THE HEMOGLOBIN CONTENT OF THE BLOOD OF THE HEN: A STATISTICAL STUDY OF INFLUENCES AND RELATIONS

IN another communication[1] results were presented of a study of the hemoglobin content of the blood of chickens and wild fowls. The method of hemoglobin determination was that of Newcomer. A correction was introduced for at least the greater part of the turbidity of the acid hematin solutions prepared from bird blood for hemoglobin determination by the Newcomer method. The correction formula is

$$C = 0.91U - 1.49,$$

where C is the corrected reading and U the uncorrected reading.

Table 1 shows the hemoglobin content of the blood of the hens and the pullets studied.

TABLE 1

MEAN HEMOGLOBIN CONTENT OF THE BLOOD OF HENS AND PULLETS

	Number of individuals	Uncorrected hemoglobin	Corrected hemoglobin
		gm per 100 cc	*gm per 100 cc*
White Leghorn hens	101	12.8 ± 1.0	10.2 ± 0.9
White Plymouth Rock hens	101	12.3 ± 0.8	9.8 ± 0.7
Rhode Island Red hens	102	11.9 ± 0.7	9.4 ± 0.7
White Leghorn pullets	101	11.4 ± 0.7	8.9 ± 0.7

The data in this table indicate breed differences, and one purpose of this paper is to present the results of a statistical study made to determine if such differences are significant.

Since data on the age of the birds at the time of making the hemoglobin measurements, on the age at maturity and on the spring egg production were available through the cooperation of the College Poultry Husbandry Department and the dates of making the hemoglobin measurements were known, it was deemed worth while to make a statistical study of the correlation between hemoglobin and these different factors. A presentation of these results is the second purpose of this paper.

For the purposes of this statistical study it is immaterial whether corrected or uncorrected hemoglobin readings be used. The latter readings are used in all instances.

The statistical constants were calculated according to the method given by Wallace and Snedecor.[2]

[1] H. H. Dukes and L. H. Schwarte, *Amer. Jour. Physiol.*, 96: 89–93, 1931.

[2] H. A. Wallace and G. W. Snedecor, "Correlation and Machine Calculation," Official Publication, revised edition. Iowa State College, Ames, Iowa, 1931.