

## 28. COMMISSION DES NÉBULEUSES ET DES AMAS STELLAIRES

PRÉSIDENT: M. V. M. SLIPHER, *Director of the Lowell Observatory, Flagstaff, Arizona, U.S.A.*

MEMBRES: Madame Roberts, MM. Bailey, Bigourdan, H. D. Curtis, Hagen, Horn d'Arturo, Hubble, Knox-Shaw, Lampland, Lundmark, Madwar, Parvulesco, Reynolds, Shapley, Van Maanen, Wright.

Since the last meeting of the International Astronomical Union the Commission on Nebulae and Star Clusters has suffered a severe loss in the death of Dr Dreyer whose work in this field has permanently linked his name with advancement in this branch of astronomy.

What appears to be a very important advance in the study of the nebulae has recently come from an unexpected source. Reference is made to the valuable work of Dr Bowen on the identification of the so-called "nebulium" lines, which have long stood out with those of hydrogen as the most prominent features in the spectra of the gaseous nebulae, and also to his suggestions regarding the physical nature of the planetary nebulae. This valuable step it is hoped may lead to still further extensions.

In the regular course of research in this field much important work has been carried forward during the interval since our last meeting by the different investigators engaged in studies of the nebulae and clusters. Any adequate review of these advances would require considerable space and as they are already fairly well known to the members of this Commission such a review is not needed here.

*Surveys.* It was the sense of the Cambridge meeting that further photographic surveys of the nebulae and clusters should be encouraged and carried forward as rapidly as possible, and that it is highly desirable that the results of this work be assembled in a uniform illustrated catalogue. It appears evident—perhaps more so now than then—that this survey work should be articulated with the very considerable work that has been done in the past in this direction at several observatories. Begun by Roberts, Keeler, Barnard, Wolf, etc., the photography of the nebulae and clusters has been greatly advanced at Lick, Yerkes, Harvard, Heidelberg, Helwan, Mt Wilson, Cordoba, Lowell, etc. It appears wise to regard the future work as an extension of the survey work that has already been done in this direction and for the fullest possible utilization to be made of the valuable accumulations of photographic material available.

Unfortunately some of the instruments that it is hoped will share in the survey with moderately powerful reflectors have for different reasons not been available, among these the Lowell reflector, because otherwise fully occupied. Hence the time has not seemed opportune to urge the inauguration of the co-operative survey programme. Lately this situation as regards the availability of instruments appears more promising and all those willing to share in this co-operative work are urged to undertake as soon as possible active participation in this original work of recording photographically a considerable additional number of the brightest nebulae. (In the report of the Cambridge meeting was printed Dr Hubble's suggestions on a plan for the co-operative survey of the brighter nebulae with large reflectors, to which reference is made for details of methods suggested.)

There appears to be some question regarding how our Commission can be most helpful in furthering such a programme—whether it is not by way of endorsing and encouraging rather than directing. It is believed it can encourage and aid

efforts in this direction and be helpful in other work which would not or might not otherwise be undertaken. It is doubtless regarded by the Commission as important that the investigator shall always feel and exercise full freedom in choice of problems that his interests, powers and facilities may most fully function. Still it seems desirable and possible that valuable survey work may be undertaken on a co-operative basis and that it will yield most satisfactory results for the advancement of the study of the nebulae and clusters.

*Cataloguing.* Prior to the meeting at Cambridge a system of classification of the nebulae proposed by Dr Hubble was distributed to the members of the Commission and it and the general subject were discussed at that meeting. Since then other schemes for the classification of the nebulae have been published. For the best utilization of the observational material of the above photographic surveys with large reflectors of the nebulae, methods of describing and classifying the objects will be needed. This need is perhaps not an immediate one and in the meantime it may become apparent what will be most suitable methods of describing and classifying the nebulae. Different investigations are most apt to call for different groupings of the nebulae based upon their different qualities, and consequently the important features of a classification system are likely to be weighed differently by different investigators. Besides the unequal powers of the instruments different observers use in pursuing their studies will influence the classification requirements somewhat in proportion to the difference of instrumental power. It will then not cause much surprise when it is reported here that rather diverse views are held by different members of our Commission on the classification of the nebulae. But the survey work comes first and the efforts at uniformity in this will, it is to be expected, yield results that will in themselves throw considerable light on how best to describe and classify the material to have it most available to the needs of further study of nebulae.

It is understood that the survey work with the 24-inch Bruce photographic refractor of the Harvard Observatory's southern hemisphere station has continued vigorously and it is hoped that Dr Shapley may be willing to report personally on its progress and results.

The Sub-Committee dealing with the Bibliography of nebulae may wish to report directly on its progress and its plans.

Dr Curtis suggests that some observatory take up the photography for accurate positions of numerous suitable small nebulae of the spiral family, not too far from the galactic plane, with the view to their furnishing us the most distant possible reference system, which will in time give important service in various problems including that of the rotation of our galaxy. In this matter time is a vital factor and the sooner the first series of photographs is made the sooner will the undertaking bear fruit.

Van Maanen wrote under date December 20, 1927:

The papers by Curtis and Lundmark have emphasized that the proper motions of the nebulae as a whole are as yet in a very unsatisfactory state. The want was felt for plates which were made for the purpose of determining proper motions with the high accuracy which can be attained with present instrumental equipment. Accordingly a homogeneous programme was started to secure first-epoch exposures of 30<sup>m</sup> each on Eastman 33 plates of such spirals which, according to Dr Curtis, have a stellar, or almost stellar nucleus. Rotating sectors are used in the case where the nucleus would be brighter than the comparison stars, which will be of 16th to 18th magnitude. For 40 fields first-epoch plates have now been secured with the 100-inch reflector.

For three globular clusters total motions and internal motions have been derived from plates taken partly at the Newtonian and partly at the Cassegrain focus of the 60-inch. The results show that the internal motions are small, of the order of  $0''.001$  annually, or less, while absolute motions of the three clusters, Messier 13, 56 and 2 are respectively  $0''.001$ ,  $0''.007$  and  $0''.009$ .

The General Secretary has transmitted to this Commission a resolution from the Dutch national committee as follows:

It is proposed to determine the parallaxes of all clusters known to be globular by means of the periods of  $\delta$  Cephei variables or the mean apparent magnitudes of the 25 brightest stars occurring in the clusters. These data together with a determination of the diameter of the clusters will furnish a value for the absorption of light in space with a probable error of 0.40 magnitude per 100,000 parsecs.

Our Commission is glad to lend its support to this undertaking, and as Dr Shapley has done work in this direction it may be that he will be willing to give some account of what has been accomplished.

It is urged that further consideration be given, in the photography of nebulae of the spiral family, to securing data on their brightness, perhaps on the basis of relative exposures, using as reference objects two or three conveniently available bright nebulae.

Likewise information on the spectral type of these nebulae is of fundamental importance. The spectrographic observation of the nebulae and clusters has continued at the Lowell Observatory, and results have also been secured at the Mount Wilson Observatory. But much remains to be done in this field.

The interest of the sessions of the Commission at the approaching meeting will be augmented, it is hoped, by personal reports of work and by the proposals and suggestions from the different members in attendance. The report herein contained may be of service in forming a basis of discussion.

V. M. SLIPPER  
*President of the Commission*