28. COMMISSION DES GALAXIES

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INTRODUCTION

The development in recent years in the domain of the Commission has been singularly rapid. Alongside extensive work based on observations in the optical region, eminent research on the galaxies has been carried out in the radio region. The importance of the radio-astronomical work on the galaxies has increased enormously thanks to the large and efficient radio telescopes now in use.

The present report is based greatly on communications received from members of the Commission. The reports from the Chairman of the Group on Galaxy Photometry, Dr G. de Vaucouleurs, and from the Chairman of the Committee on Super-novae, Dr F. Zwicky, are given in extenso. A report prepared by Dr B. Vorontsov-Velyaminov on researches on galaxies in the U.S.S.R. is also included. The extensive report of the Committee on the Magellanic Clouds by its Chairman, Dr S. C. B. Gascoigne, is given separately.

It has been considered to be of great advantage to have a report on extra-galactic radio-sources together with the optical data. An extensive report on work in the radio region has been given here by Dr J. F. Denisse, President of the Commission 40 on Radio Astronomy.

Finally a summary is given by Dr A. L. Zelmanov on researches in the U.S.S.R. on cosmology and related topics of general relativity.

OPTICAL REGION

Radial velocities

W. A. Baum (1) has continued his observations of redshifts by measuring photo-electrically the energy received from galaxies in eight colours ranging from ultra-violet to infra-red. The comparison of spectral-energy distributions of galaxies yield both their redshift and their relative bolometric magnitudes. Redshifts up to a symbolic velocity $c\Delta\lambda/\lambda = 132\,000$ km sec^{-1} (cluster 1410 + 5224) have been observed using the pulsecounting photometer at the prime focus of the Palomar 200-inch telescope. 31 galaxies in three clusters of 12 800, 13 200 and 51 900 km sec^{-1} recently measured provide three more points on the redshift-magnitude relation. Baum is now exploring the possibility of establishing an accurate redshift-diameter relation.

D. S. Evans has started determinations of radial velocities of Southern Galaxies with the

Radcliffe reflector at Pretoria. About 30 systems not fainter than about magnitude 13 have been investigated.

E. Vandekerkhove (**2**) has examined the gradient at 5000Å in a few galaxies in relation to the radial velocities.

E. Holmberg (**3**) has continued his elaborate investigations of possible systematic errors in measured redshifts. An effect possibly connected with a parameter correlated with apparent magnitude is now examined. G. and A. de Vaucouleurs (**4**) and J. Neyman and E. L. Scott (**41**) find no appreciable bias in the redshift data of bright galaxies.

M. Schmidt has described the Mount Wilson programme in which optical spectra have been obtained for 30 of the 50 galaxies identified with radio sources (*Notes on Discussions of Galaxies*, Berkeley, August 1963, by Thornton Page). The redshifts indicate absolute magnitudes of -20 ± 1 (using $H = 100$ km sec^{-1} Mpc^{-1}). Three are as faint as -18 and NGC6166 is -22. The five extraordinary ones with large redshifts may have absolute magnitude -25. They range from 3C48, $16^{m}{\cdot}2$ redshift 0·368, to 3C273, $12^{m}{\cdot}7$ (variable) redshift 0·158, with an optical 'tail' 20″ away; and all are radio sources of small diameter (a few seconds of arc). The others are 3C147, 3C196 and 3C286, all very small and very luminous.

Redshifts of 92 galaxies have been determined by N. U. Mayall and A. de Vaucouleurs (**5**).

G. and A. de Vaucouleurs (**6**) have given classification and radial velocities for bright Southern galaxies previously observed at Mt Stromlo. A new radial velocity survey was started in 1960 at McDonald Observatory; about 120 galaxies have been observed so far.

General and multicolour photometry.

G. and A. de Vaucouleurs have given much work to all kinds of photometric research on galaxies. Concerning photographic surface photometry the detailed work on bright Southern galaxies has been continued with improved isophotometers (**6**). Data for about 70 galaxies are reduced. A new digital method developed by W. Jones and R. M. Gallet, at the National Bureau of Standards, Boulder, Colorado, has been modified for the purpose.

Photo-electric *UBV* scans of NGC55, 300, 4487 (M87) and of the Sculptor, Fornax and Draco systems have been reduced. As a rule the $r^{1/4}$ law of luminosity distribution holds for giant ellipticals but not for dwarfs (**7**).

Integrated magnitudes and colours in the *UBV* system for some 550 galaxies north of $-40°$ have been measured with the 36-inch reflectors of McDonald and Kitt Peak observatories. Earlier observations at Flagstaff comprising 148 galaxies were published (**10, 11**).

The *Reference Catalogue of Bright Galaxies* giving data on types, diameters, ellipticities, colours, surface luminosities, velocities, and bibliography for 2600 galaxies was completed; it will be published by the University of Texas Press in October 1964 (**8**).

G. de Vaucouleurs, as Chairman of the Group on Galaxy Photometry, has made the following summary of work reported to him up to 10 October 1963.

REPORT OF THE WORKING GROUP ON GALAXY PHOTOMETRY
(prepared by G. de Vaucouleurs)

A most gratifying increase of interest and activity in the field of galaxy photometry has taken place in the two years since the formation of the Group on Galaxy Photometry at the Berkeley meeting in 1961. From answers to Circular no. 2 received to date the following summary was prepared:

1. *Photographic photometry* (*out of focus or Schraffier-k.*):

F. Zwicky and E. R. Herzog (Pasadena) have completed work on 89 Palomar 48-inch fields