relationships are possible and depend on the law of energy-exchange between matter and radiation inherent in the definition of each model.

G. C. McVittie (*M. N.*, **155**, 425) reconstituted the apparent magnitudes (V_c) of the brightest members of 39 clusters of galaxies from Hubble diagrams, and other indirect sources of information, which were to be found in the literature published up to September 1971. A statistical analysis of these led to the empirical conclusion that $V_c - 5 \log z$, where z is the redshift of the cluster, is a constant for the 39 clusters, whose redshifts range from 0·0128 to 0·461. A theoretical method was developed for finding the parameters, q_0 and σ_0, of zero-pressure models of the universe when the empirical conclusion is accepted. Pairs of values of (q_0, σ_0) such as (0·72, 1·09), (1·28, 0·92), (1·34, 0·83) are consistent with the data. The data also determine a relation between the Hubble constant H and the (constant) absolute magnitude M_V of the brightest cluster members.

A. M. Wolfe and G. Burbidge (04.162.029) examined the smoothness of the isotropic X-ray background; if it were due to clusters or superclusters of galaxies, the fluctuations that would be present would exceed those observed. The background may arise from more numerous and smoothly distributed objects of lower luminosity. Hierarchical universes in which the distribution of X-ray sources follows the cosmological mass distribution are ruled out.

Starting from Liouville's theorem, W. C. Saslaw (*Ap. J.*) developed general expressions for the growth of correlations in isotropic systems of gravitating point particles, and applied these to investigate the early evolution of clusters and density fluctuations in an expanding universe. The time scale for the development of clustering can be considerably shorter than the time scale for the growth of linear hydrodynamic perturbations. Successive stages of clustering to form galaxies, clusters of galaxies, and superclusters, can occur in simple models of our universe. The results also suggest a simple explanation for the observed secondary maxima of the density distributions within clusters of galaxies.

E. M. BURBIDGE
President of the Commission

WORKING GROUP ON GALAXY PHOTOMETRY AND SPECTROPHOTOMETRY

(Compiled from Circular No. 10 and Supplement, by J. L. Sersic)

H. D. Ables completed an optical study of nearby galaxies (*Pub. U.S. Naval Obs.*, **20**, 1). G. E. Kron, H. D. Ables, and A. V. Hewitt (*P.A.S. Pacific*, **84**, 303) carried out electrographic *UBV* photometry of the jet in 3C 273. H. D. Ables and P. G. Ables have made a comparison of electrographic, photographic, and photoelectric photometry of NGC 4881 (in press), and H. D. Ables and G. E. Kron have carried out electrographic *UBV* photometry of the jet in M 87. A photometric study by H. D. Ables of the Magellanic irregular type galaxies in the Reference Catalogue of Bright Galaxies is in progress. Studies of NGC 1569, IC 1613, and a A 1009 have been completed and published. The *B* and *V* surface photometry of A 2359 has been completed and the study of A 0956 is in progress.

G. F. Benedict completed a thesis on "Two Color Photographic Superposition Photometry of Lenticular Galaxies in the Virgo Cluster." Luminosity and color index profiles and gradients, integrated magnitudes and colors, concentration indices, effective radii, colors, and surface magnitudes, ellipticity and inclination values and major axis position angles were obtained for NGC 4254, 4267, 4298, 4302, 4313, 4321, 4377, 4379, 4380, 4388, 4419, 4425, 4429, 4435, 4438, 4461, 4503, 4531, 4548, 4550, 4552, 4564, 4567, 4571, 4596, 4608, and 4621. The limiting magnitude reached for these galaxies was $B/(")^2 = 24{\cdot}00$. Significant differences in photometric parameters between Morgan D-type and normal elliptical and spiral galaxies were found, and surprising similarities between the local color-index variations in D-type and spiral galaxies.

At Cordoba a spectrophotometric study of the nucleus of NGC 613, 1672, 1808, 2997, 5236, and 7552 has been made by M. Pastoriza. She also gives the photographic magnitudes of these nuclei and separately their condensations. An extensive photometric and spectrophotometric study of NGC 5253 has been made by M. Pastoriza, G. Carranza and J. L. Sersic. E. Agüero and J. L. Sersic

have done two-color photometry of a chain of galaxies in Centaurus (R.A. 12^h, Dec. $-40°$). H. Dottori has successfully finished an investigation on the absolute calibration of Sabatier isodensities.

A photometric study of the structure of NGC 205, by P. W. Hodge, begun in 1960, was completed in 1971. The study includes photoelectric surface photometry of the brightness and color across the face of NGC 205, photometry of its O and B supergiants, photometry of its twelve most conspicuous dust clouds, detailed isophotometry in three colors, and study of its luminosity profiles. A similar photometric program for NGC 147 is also complete. K. Krienke determined isophotes in V for the abnormal-structured galaxy NGC 520 and is measuring photoelectric surface brightness across the disk of the system.

A complete set of calibrated isophotes for M 31 was constructed by P. W. Hodge from 48-inch Palomar Schmidt plates (Astr. Soc. Pacific meeting, Penticton, 1971; also third ed. Shapley's *Galaxies*). Photoelectric surface brightness measurements by P. W. Hodge are in progress on NGC 499, 524, 628, 750, 751, 925, 1068, 1156, 1300, 1350, 1365, 1374, 1379, 1380, 1381, 1386, 1387, 1389, 1399, 1404, 1427, 1437, 1600, 2403, 2655, 2855, 2911, 3077, 3377, 3384, 3379, 3389, 3412, 3448, 3489, 3955, 5363, 5457, 5474, 5566, 5574, 5576, 5580, 5701, 5850, 6703, 7332, 7793, Peg. I Cluster.

G. D. Mackay, J. Ring, and colleagues used a 'Spectracon' electronographic image tube on the Isaac Newton Telescope at Herstmonceux to provide two-dimensional photometric data (mainly B and V) on the brightness distribution of 3C supergiant radio galaxies and of other field elliptical galaxies, to study features that may be related to the radio structures. Tests of the linearity and noise performance of the device used suggest that the accuracy of the results is comparable with that achieved by more conventional photoelectric detectors.

P. Nilson compiled a General Catalogue of Galaxies (Uppsala) containing data for 12921 galaxies between declination 90° to $-2°30'$. Blue and red diameters were measured on the Palomar Sky Survey prints, and the catalogue is as complete as possible to the limiting diameter $1'.0$ in blue; it contains all galaxies to the limiting magnitude $14^m.5$ in *Catalogue of Galaxies and Clusters of Galaxies* by F. Zwicky *et al.* The catalogue gives rather full data for the main entries, and less extensive data for several thousands of companion galaxies.

G. Paal estimated minor and major isophotal diameters for about 500 galaxies in rich clusters of galaxies. This work continues earlier work mentioned in *Trans. IAU*, **XIV B**, p. 188 (see also *Astrofiz.*, **7**, 435). In a cooperative program between Pulkova and Tautenburg isophote diagrams in *UBVR* for NGC 3031 (M 81) and the globular cluster M 92 were constructed by equidensities. The axial ratio, the position angle of the major axis and the relative surface brightness in dependence of the semi-major axis was determined (Högner, Kadla, N. Richter, and Strugatskaja).

J. E. Solheim worked with G. de Vaucouleurs on intermediate band photometry of galaxies. About 60 galaxies of all main types were observed in 10 colors from $\lambda = 3400$ to 5500 Å, with intermediate (~ 100 Å) band filters.

E. Vandekerkhove measured spectrophotometric gradients of galaxies and QSOs and compared them with those of blackbody and non-thermal radiators (*Bull. Acad. Roy. Belgique*, **8**, 776; **11**, 1233; 05.115.012). S. van den Bergh found a pronounced color gradient in the main body of NGC 5128. Near the poles the galaxy is quite red but the colors become progressively bluer on approaching the equatorial dark lane. The object may contain a young bluish population component superimposed on the old red population which contributes most of the luminosity in this galaxy. It is not yet clear whether the knots in the bright equatorial bands are H II regions or star clusters. A single measurement through a 10 second diaphragm with the Cerro Tololo 60-inch gives $= 14{\cdot}17$, $B-V = 0{\cdot}41$ and $U-B = -0{\cdot}58$ for the brightest of these knots. A model in which the explosion that gave rise to the radio source Centaurus A also produced a burst of star formation is discussed, which may apply also to NGC 1275. Spectrographic observations of this show a strong dependence of the spectrum on position. The total mass of the young stellar population in E galaxies, however, is almost certainly quite insignificant compared to that of the old stellar population in such objects.

G. de Vaucouleurs catalogued integrated V magnitudes and $B-V$, $U-B$ color indices for 461 bright galaxies ($\delta > -50°$) observed between 1960 and 1968 mainly with the McDonald Observatory 91-cm reflector. The Catalogue includes over 1000 observations by 13 observers in 219 nights. The

mean error of one observation is $\pm 0{\cdot}04$ mag. in V, $\pm 0{\cdot}030$ in $B-V$, and $\pm 0{\cdot}045$ in $U-B$. Color indices were statistically corrected for galactic reddening and redshift $(B-V)_0$, $(U-B)_0$, and for aperture and inclination effects $(B-V)_{oc}$, $(U-B)_{oc}$. Mean corrected color indices (and corresponding metallicity index) are tabulated for each galaxy type along the revised Hubble sequence.

The luminosity effect in the colors of elliptical and lenticular galaxies is once again verified; no such effect is indicated for spirals. For the latter, negative color residuals are quantitatively related to spectral estimates of emission line intensities, both for general line emission and for nuclear emission in Seyfert galaxies. A normalized mean relation between (negative) color excess and aperture ratio depending only on nuclear luminosity is derived for the Seyfert galaxies.

A. E. Whitford found that absolute energy curves of giant elliptical galaxies derived from scanner observations with a mean aperture/diameter ratio $A/D(0) = 0{\cdot}6$ led to K-corrections smaller than the older Oke-Sandage values. The consequent revision of the deceleration parameter is $\Delta q_0 \simeq -0{\cdot}5$ (06.158.085). Surface spectrophotometry now in progress uses the scanner to compare relatively unblended samples of the population in the spheroidal and disk portions of flat galaxies; both the continuum and population-sensitive indices are measured. In spirals interarm areas are chosen for comparison with SO systems. The nuclear bulge of our galaxy near NGC 6522 is included in its study.

The failure to detect the Wing-Ford band at 9910 Å in the nuclear region of M 31 (Whitford, *B.A.A.S.*, **4**, 230, and later unpublished scans of late M dwarfs) is at odds with the Spinrad-Taylor population model.

C. W. Fraser reported work carried out at St. Andrews between September 1969 and August 1972. The major program on the determination of standard parameters in the B and V system for 46 galaxies in the Virgo Cluster was completed in February 1971 (*Obs.*, **92**, 51). Isodensitometry with a digitized Joyce Loebl machine will give data that will be stored on magnetic tape. This work should permit accurate color measurements to be made of small areas of galaxies with large angular diameter.

From Tautenburg, N. B. Richter reported that Högner developed an automated procedure for obtaining photographic equidensities in galaxies, and used it to measure the outermost boundaries of M 31, M 32, and NGC 205. Högner and N. Richter determined the diameters of 11 large galaxies in the region of the Virgo bow by this method. The new diameters were 2·2 times larger than those in de Vaucouleurs catalogue. In some cases the new diameters were 4 times larger.

A detailed U, B, V photometry of NGC 4151, 4156, 3593, 3623, 3627, and 3628 has been performed on plates obtained with the 70-cm meniscus telescope of the Abastumani Astrophysical Observatory (T. M. Borchkhadze).

EXTRAGALACTIC ASTRONOMY IN THE U.S.S.R. FROM 1969 TO 1972*

B. Vorontsov-Velyaminov

The majority of papers are devoted to the photometery, colorimetry and polarimetry of the Seyfert and Markarian galaxies, to statistical studies and to the theory of mass, density and velocity distributions. The report on the theory of spiral structure belongs as usual to Commission 33 and that on radio studies to Commission 40.

B. Markarian (01.158.033, 02.158.079, 03.158.020; *Aph*, **7**, 521, the last with Lipovetsky) published three more lists of galaxies with a strong ultraviolet continuum. Their number now amounts to nearly 400. Their preliminary spectra and the values of z were studied by the team M. Arakelian, E. Dibai, V. Yesipov, B. Markarian (03.158.059, 04.158.030, 04.158.031, 04.158.096, 05.158.083, *Aph*, **7**, 177, **8**, 33, 177) and by E. Denisyuk (*AC* 615, 621, 624).

Emission lines were evident in 250 objects. One of them, possibly with Seyfert characteristics, is a dwarf with $M = -14$ and 400 pc in diameter. Some objects do not differ from QSOs. Some were found among the interacting galaxies and some are of the Seyfert type. Photoelectric photo-

* The *Astronomical Journal* and the *Astronomical Circular* published in U.S.S.R. are denoted by *AZ* and *AC*, respectively. *Astrophysics* published in Erevan is denoted by *Aph*.

metry of some of the Markarian galaxies was made by E. Dibai (*Aph*, **6**, 350), by Dibai, M. Arakelian and V. Ljutyi (*Aph*, **8**, No. 3). The objects strongly deviate from colours of main sequence stars. Object 279 is variable. M. Arakelian (*Aph*, in press) calculated the luminosity function of these Markarian objects. They constitute 7% of the field galaxies of high luminosity. Seyfert galaxies with $M_{ph} < -17{\cdot}5$ form 0·005 of the total number of galaxies of these luminosities. He showed (*Aph*, in press) that the gradient of their surface brightness correlates with other characteristics, while the dwarfs with $M_{ph} > 16$ have an average space density possibly close to that in the local group (*Aph* in press). The new Seyfert galaxies were extensively studied spectroscopically and spectrophotometrically by E. Khachikian, most often in collaboration with D. Weedman (01.158.041, 04.158.103, 05.158.043, 02.158.034). Variability of spectral emission features, Hα in particular, was studied by I. Pronik (*AC* 663), V. Ljutyi and A. Cherpashchuk (*AC* 633, 688). B. Vorontsov-Velyaminov (*AC* 654) discovered an outstanding chain of five galaxies at $2^h\ 48^m5$, $-35°13'$. Two of them are connected by a bridge. The study of their velocities is much needed.

K. Chuvaev and V. Pronik systematically observed the spectra of some N and Seyfert galaxies with 100 Å mm^{-1} dispersion for the detailed line profiles of hydrogen (*Aph*, **8**, in press, *AZ*, **49**, 768, *AC* 663). V. Pronik and A. Scherbakov (*Aph*, in press) have found changes in brightness on photographs of the condensations in M 87. L. Nazarova with A. Scherbakov (*AC* 648, *Izv. Crimean Aph. Obs.*, in press) and with B. Artamonov (*Izv. Special Aph. Obs.*, in press) studied NGC 4303 and M 82, respectively, and obtained the distribution of energy in their different parts and discussed the origin of the differences found. I. Pronik (*Izv. Crimean Aph. Obs.*, **45**, 162) has shown that statistically the central regions of the SB galaxies are bluer than in SA galaxies. L. Metik and I. Pronik (*AZ*, **49**, in press; *Izv. Crimean Aph. Obs.*, **49**, in press) from the existing photometric data estimated the amount of dust in the central regions of 81 normal galaxies. The maximum value is $10^5\ M_\odot$. A. Abramenko and V. Prokofjeva (*Variable Stars*, **18**, 157; *AC* 635) adapted television techniques to the observation of galaxies, for the search of supernovae in particular. B. Vorontsov-Velyaminov, G. Zaitseva and V. Ljutyi (*AZ*, **49**, 93) measured in *UBV* the 'hot' blue nuclei of some spiral galaxies and gave a list of such galaxies with complicated unusual nuclei. In the *UBV* system the brightness and variability of Seyfert galaxies were observed photoelectrically with various diaphragms by V. Ljutyi, sometimes with collaborators (01.158.015; 01.158.016; 02.158.083, 04.158.104; *AC* 620, 626, 647; *Aph.*, **7**, 169). He and A. Zasov (*AC* 658) concluded that these galaxies differ from normal galaxies in having a very steep radial gradient of surface brightness. Photographic photometry of the compact objects was carried out by seven astronomers (*Trud. Astr. Obs. Leningrad Univ.*, **29**, 30). N. Kurochkin (05.158.037) cast doubt on the reality of light variation of objects with emission lines in their spectra but next to this he himself found very large variability of the QSO OJ 287 (4^m!) and studied with positive results the variability of the extragalactic object BL Lac (*AC* 702). G. Khozov observed NGC 1068 (03.158.107) and an explosion of Per A (05.158.039) also in the infrared. Gudzenko, L. Ozernoy and Chertoprud (*AZ*, **48**, 472) using mathematical statistics of brightness increases on the light curve concluded that 3C 273 must be a single body. V. Kurilchik (02.158.017) considered the variations of optical emission lines in Seyfert galaxies. A. Zasov and E. Dibai (03.158.039) discussed the integral characteristics of Seyfert galaxies. Polarization of N and Seyfert galaxies, radiogalaxies and of related objects and its variation was measured by V. Dombrowski, M. Badadzhanjanz, V. Hagen-Torn, E. Semenova and published in various combinations of these authors (01.158.062, 02.158.018, 02.158.081, 03.158.103; *Aph*, **7**, 417; **6**, 1; *AC* 498, 526, 571, 607, 614, 701). J. Efimov and N. Shahovskoy (*Izv. Crimean Aph. Obs.*, **46**, 1972; *AC* in press) observed the multicolor polarization of QSOs, N and Seyfert galaxies which vary in a complicated manner in the dependence on wavelength and the position angle of the polarization plane. The polarization in 3C 345 at the outburst amounted to 45%. Circular polarization in NGC 1068, 4151 and 3C 273 was found by A. Severny and his team (*Ap. J.*, **170**, L53), but this was not confirmed. Possibly it is variable. The origin of emissions in radio galaxies was discussed by R. Vardanian and Y. Melik-Alaverdian (01.158.043).

More normal galaxies were subjected to surface photometry or colorimetry in the following papers: by A. Kalloglian, SB galaxies (02.158.013; *Aph*, **7**, 189), NGC 584, 586, 596, 600, 615, 636 by S.

Arakelian (05.158.033), stellar associations in NGC 6946 by Khachikian and Sahakian (04.158.062 = 03.158.082) and in 12 distant galaxies by R. Shahbazian (04.158.084); the peculiar NGC 1023 by B. Derevianko (*Uchenie Zapiski Leningrad Univ.*, No. 359, p. 32), NGC 3623, 3267, 3628, 3593, 4151, 4156 and others at Abastumani Observatory (in press), NGC 3351, 4051, 4618, 4826 by B. Vorontsov-Velyaminov and M. Saveljeva (*AZ*, **50**, in press). B. Vorontsov-Velyaminov and R. Noskova determined the radial gradient of brightness of the flat component and the diameters of the spherical component of some hundred galaxies and made statistical generalizations (*AZ*, **49**, in press). They (*AC*, in press) also derived values of the real flattening for different morphological types based on their former photometric results. The run is in accordance with de Vaucouleurs' results obtained from other data. I. Pronik and K. Chuvaev (04.158.022) made a surface colorimetry of NGC 4254 and of M 51 (*Izv. Crimean Aph. Obs.*, **43**, 101).

Problems of galactic structure were presented in the following papers: D. Dzigvashvili and T. Borchhadze discussed the application of the formula of the logarithmic spiral to galaxies (03.158.008 = 03.158.073). The nuclei of Sa galaxies were considered by K. Sahakian (03.158.021) and the nuclei more generally by V. Ambartsumian (01.158.074). A. Kalloglian (05.158.031) found a closer correlation of the Sculptor type dwarfs with SB galaxies than with SA. He also studied (*Aph*, **7**, 521) the morphology of some Markarian galaxies (many of them happened to be SB) and of the galaxies in the cluster A 262 (*Aph*, **8**, 43), 75% of them are spirals. Among these 20% are SB. Yu. Efremov (04.158.057) has found a gradient in the frequency of periods of cepheids in M 31. He finds that on the inner edge of the spirals they are younger in agreement with the density wave theory. The problem of comparison of galaxies in different catalogues was raised anew by L. Genkina (03.158.049). She derived coefficients to transfer Hubble's diameters to the Vaucouleurs system.

Statistical studies will be helped by the transfer to IBM 220 magnetic tape by Kogoshwilly (at the Abastumani Observatory) of the Morphological Catalogue of Galaxies compiled by Vorontsov-Velyaminov and Arhipova. These entries are supplemented by further data. Now the latter authors have completed the 5th part of this catalogue which makes the information about galaxies complete to 15^m and to $\delta = -45°$. The luminosity function $f(L)$ was discussed by E. Nezhinsky and L. Osipkov (02.158.082), by M. Arakelian and A. Kalloglian (02.158.074), $f(L)$ in the cluster A 262 by A. Kalloglian and $f(\mathscr{M})$ for field galaxies of various types by L. Genkina (02.158.022). The distribution of diameters $f(D)$ was studied by Karachentsev *et al.* (04.158.097). I. Jankulova (*AC* 647) studied the distribution of Markarian galaxies according to diameters and luminosities. The $f(L)$ function for the field galaxies was also discussed by E. Denisiuk (*Trud. Aph. Inst. Alma Ata*, **16**, 119). The same author developed a method of finding the true ellipticity for E galaxies from their isophotes which he measured himself (02.158.023). It appears that substantially new and reliable data on the luminosity function can be obtained only after considerable discussion of the radial velocities measured for remote and for intrinsically faint galaxies. Statistical study of masses and of the average density was carried out by I. and L. Genkina (02.158.020, 02.158.019). They studied also the value of $\mathscr{M}/L$ (02.158.033 and 04.158.015), the correlation of $\mathscr{M}$ and R for ellipticals (02.158.015), and the energetic characteristics in Hubble's sequence (02.158.021). I. Karachentsev (05.151.004) has found the mean square peculiar velocity of galaxies equal to 270 km s^{-1} not very different from that obtained 36 years ago by Vorontsov-Velyaminov, and Kramer B. Fesenko (*AZ*, **49**, 97) by statistical methods finds the values of the total absorption in galaxies and its dependence on their inclination as the latter is given in MCG. L. Genkina (*Trud. Ap. Inst. Alma Ata*, **19**, 8) from side evidence concludes that the E galaxies do rotate. B. Vorontsov-Velyaminov showed (02.158.062) that statistically, at least, the spiral arms are confined to a region of the solid body rotation. The exceptions are few. He also found (04.158.038) that, contrary to expectation, the period of rotation diminishes as the flattening of galaxies increases. He confirmed this again (*AZ*, **50**, in press) using additional data. Vorontsov-Velyaminov (02.158.085; 03.158.048 and 04.158.090) gave a revised list of masses for more than a hundred galaxies and their nuclei. Optical and radio data were weighted and reliability of the data shown. Some new masses were added. His value of $\mathscr{M}/L = 8$ for all types of flat galaxies was subsequently confirmed by M. Roberts and others.

B. Fesenko (05.158.030) gave a formula for evaluating the true ellipticity of objects taking into

account selection effects. B. Vorontsov-Velyaminov (*AZ*, **50**, in press) showed that the corrections recommended by Holmberg to the visually measured apparent axial ratio are exaggerated. Further, the dimensions of the spherical component are inadequate for use in the study of dimensions of spiral galaxies. Calculation of the true flattening depends strongly on the interpretation of the apparent flattening.

A good statistical treatment of the Sculptor type galaxies was presented by V. Karatchentseva. She found that in the local cluster they form a compressed system in the Supergalactic plane (03.158.055), they have the average true b/a ratio 0·53 (05.158.025). In the four nearest groups there is a correlation between the luminosity of the principal members and the average diameter of the dwarfs mentioned (03.158.108). In isolated pairs of a normal galaxy and a Sculptor dwarf, the 'tidal radii' and masses of the dwarfs are close to those known for the 6 nearest dwarfs (*AC* 558). Seventy new Sculptor type dwarfs were found on the two recently published southern Palomar Atlas maps (*Izv. Spec. Aph. Obs.*, **6**, in press). Vorontsov-Velyaminov and R. Noskova (05.158.091) have found that the large S and Irr galaxies of low surface brightness (1500 in number) are distributed very similarly to the common bright galaxies.

A. Sharov (*AZ*, **49**, 54), from the study of distribution of novae in M 31, concluded that if the gradient of their space density were the same as in our Galaxy, then there must be 260 galactic nova outbursts per year. Double galaxies were studied by I. Karachentsev with his collaborators. In 05.158.097 he found that pairs form 24% relative to single galaxies. The average separation is 111 kpc. In *Vestnik Kiev Univ.*, **12**, 103 he gave a catalogue of 96 pairs with known physical parameters and claimed that 70% of them are unstable. He derived the same result (*AZ*, **47**, 509) from the analysis of their velocities and separations compared to the theory of the three kinds of relative motion. With A. Sherbanovsky (04.158.082) the same conclusion was reached from the analysis of the distribution of the virial masses. The same authors (*AZ*, **49**, in press; *Ap. Lett.*, **11**, in press) using the method mentioned above, concluded the Virgo cluster and the groups are in an unstable state. G. Tovmasian (02.158.014) considered that groups of galaxies are young. I. Karachentsev, for 63 groups with measured radial velocities at least for the three of their members, determined their dimensions, luminosities and virial masses (*Problems of Cosmic. Phys. Kiev*, **5**, 201). From the correlation of velocities and apparent magnitudes of the groups Karachentsev (*Izv. Spec. Aph. Obs.*, **6**, in press) with V. Terebizh (04.151.001), for a model of spontaneous fission of the galactic nuclei, calculated the evolution of the system and obtained Hubble's relation among the mutual velocities and separations. B. Gorbachev studied the orientation (04.158.059) and the angular momenta of physical pairs (04.158.088). M. Arakeljan (*Aph.*, **6**, 531; **7**, 435; *Nature*, **225**, 358) found that QSRs and QSGs have different luminosity functions and show evolutionary effects. The luminosity of QSRs exceeds that of QSGs by $\geqslant 0^m5$. L. Einasto (*App. Lett.*, 1972, in press) finds that star formation is proportional to the second power of the interstellar gas density. The coefficient of proportionality in star formation was found to be the same in SMC, M 31 and the Galaxy. For $\zeta < 0{\cdot}01$ $\mathscr{M}_{\mathrm{H_I}}$ pc^{-3} star formation does not occur. Passing to the clusters we note that Gorbachev studied the core of the Coma cluster (03.160.008) and evaluated the mass of the cluster as between $2{\cdot}5 \times 10^{14}$ and $2{\cdot}5 \times 10^{15}$ $\mathscr{M}_\odot$ (01.160.009). He (01.160.021) studied the effects of segregation and of the general field, while A. Zasov compared the characteristics of the field and of the cluster galaxies (02.160.005). L. Ozernoi (01.160.022) has found a dependence of the average density of clusters on their morphological type. A. Gusak (02.160.020) finds that the distribution of clusters shows the existence of superclusters. I. Kurilchik discussed the nature of the X-ray emission from the Coma cluster (*AC* 655). Its kinematics was studied by R. Gainulina (02.160.006).

A. Zasov (05.158.038) and L. Genkina (*AC* 651) studied independently the distribution of the angular momenta of galaxies. The latter finds $L = a\mathscr{M}^{5/2}$. A. Mandgos and V. Telnjuk (*AC* 681) measured the orientation for 851 clusters and concluded that it favors anisotropy of the Universe. V. Sizikov (04.151.010) proposed a new method of reduction of 21-cm line profiles. He constructed models of density distribution in M 31 (01.158.042; 02.158.036), in NGC 7331 (02.158.062) and in NGC 3109 (04.151.039) using his method. L. Einasto proposed (*A.N.*, **291**, 97; 03.158.060) a new procedure for construction of models of galaxies since he showed that the mass concentration to the

centre is much underestimated when velocity data are used. He applied his method for a model of M 31 (04.158.066; 01.158.037; 02.158.062; 03.158.060; 03.158.074; 03.158.075 and elsewhere). L. Genkina (*AC* 650) using the luminosity and mass functions estimated the average density of the Metagalaxy as 2×10^{-30} g/cm^3.

The following papers are theoretical but connected with observations. B. Komberg (04.158.098) proposed a scheme of evolution of galaxies mostly of the eruptive forms, and in a preprint considered that evolution runs thus: a QSO transforms into an N galaxy, then into a nucleus of an E radiogalaxy. Komberg and L. Ozernoy (04.158.058) discussed the excited states of different kinds of galaxies and searched for possible relations. Ozernoy (*AC* 661) considered that collapse of his 'magnetoid' (representing a QSO) apparently does not lead to a black hole according to observations and does not recur. S. Kaplan and V. Zitovich (*AZ*, **49**, 647) developed a theory of active nuclei as 'turbulent cauldrons' producing distributions of relativistic particles which radiate in the infrared, in the observed amounts. G. Bisnovatij-Kogan and R. Sunyaev (*AZ*, **48**, 881) proposed a disk formed of stars which become supernovae and produce neutron stars. Accretion at their surfaces gives rise to plasma radiation with a Langmuir frequency like that observed in the infrared. S. Vainstein and A. Rusmaikin (*AZ*, **48**, 902) visualize the creation of the magnetic field of a galaxy as follows. The poloidal component of the field due to differential rotation forms a toroidal component. B. Zeldovich and Sunyaev (03.162.027) discussed small scale fluctuations of the relic radiation. With Sunyaev, Zeldovich (preprint) developed a theory of fragmentation of clusters. I. Shklovsky (04.158.069) treated the conservation of momentum and problems of metagalactic astronomy. Yu. Gnedin and A. Dolginov discussed the origin of the X-rays in the metagalaxy (03.51.734). I. Pronik and K. Chuvaev (02.158.018; 02.158.073; *Izv. Crimean Aph. Obs.*, **38**, 83; **44**, 40; **45**, 162) investigated H II regions and colours in 9 galaxies and concluded that the two-colour diagram for spiral arms is the same as that of the central region. I. Karachentsev (01.160.001) determined the optical thickness of dust in clusters of galaxies, while a search for dust in pairs and groups by V. Lipovezkiy (*Vestnik Kiev Univ.*, No. 12, 116) led to $\tau < 0{\cdot}15$. L. Ozernoy (03.158.002) studied theoretically the interaction of intergalactic clouds with galaxies and (in 03.158.003) the accretion of this gas by QSOs. O. Prilutsky and I. Risenthal (04.161.009) developed a theory of the ionization and heating of intergalactic gas by ultraviolet radiation. V. Kurt and R. Sunyaev (03.161.008) considered that intergalactic gas and subcosmic rays produce the ultraviolet background. Sunyaev and A. Doroshkevich (01.161.001) studied also the thermodynamical conditions in the metagalaxy.

Finally, it must be noted for the first time since the appearance of Vol. **53** of the *Handbuch der Astrophysik* in 1958 a reasonably large book on galaxies appeared. It is Vorontsov-Velyaminov's *Extragalactic Astronomy* in Russian, labelled as a text book, but in fact of larger scope and summarizing also the author's investigations.

WORKING GROUP ON THE MAGELLANIC CLOUDS

A. D. Thackeray

1. *General*

The Magellanic Clouds have received much attention in S. America, Australia and S. Africa, and further progress may be expected with the activation of new equipment in the near future. An excellent survey of Cloud problems was presented by Westerlund (1972) in Athens. The report presented here is to be regarded as a supplement to Westerlund's article where detailed references (by year) will be found. For further references see Section 159 of *Astron. Astrophys. Abstracts.*

The Santiago Symposium on the Clouds has been published (Ed. Muller 1971).

An important review article by de Vaucouleurs and Freeman (1969) deals specifically with structure and dynamics of barred spirals. Here the 'Magellanic Irregulars' are placed at the end of the spiral sequence and the main features of LMC and SMC, discussed in detail, are found to have much in common with such systems as NGC 4618, 4625 and 4027.