II

CLUSTERS OF GALAXIES

https://doi.org/10.1017/S0074180900144444 Published online by Cambridge University Press

PHOTOELECTRIC SURFACE PHOTOMETRY OF THE COMA CLUSTER*

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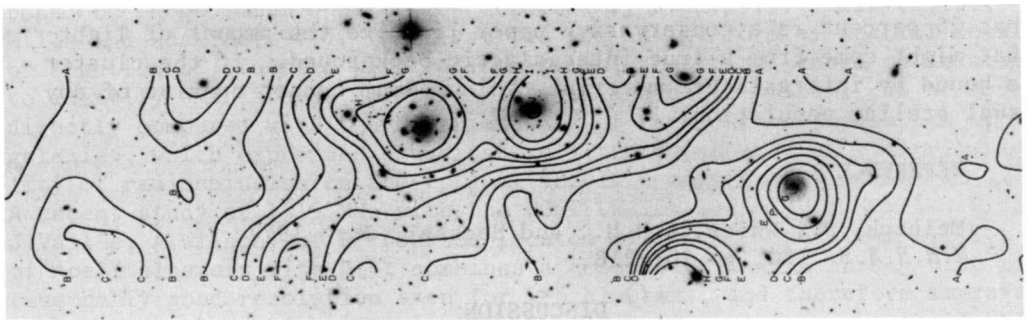
A photoelectric search is presented for light from a smooth intergalactic background in the Coma cluster of galaxies.

A fully orientable 2-inch remotely operated sky monitor was mounted on the optical axis of the Palomar 60-inch reflector in front of its secondary mirror. This small telescope was used to continuously measure a fixed patch of sky, while the main telescope carried out drift scans across the cluster covering an over-all area of 78′(RA) by 14′(DEC). This procedure reduced the effect of sky brightness fluctuations to an r.m.s. level of less than 1 percent of the sky in the individual scans. The observations were carried out in two intermediate-width bands centred at 4930 Å (g) and 6550 Å (r). A complete description of the observing and data-reduction procedures has been given elsewhere (Melnick, White and Hoessel, 1977).



Surface brightness distribution in r after removal of sky and foreground star contamination, and smoothing with a 3′.5 FWHM Gaussian. Contour levels are in 20 ct/sec steps equivalent to 26.6 mag/sec^2.

The over-all light distribution in the cluster is seen in the figure to follow very closely the distribution of galaxies in the cluster. The two supergiant galaxies in the cluster centre are seen to

*The paper was read for the authors by J. Materne.

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have a common envelope, extending more than 750 kpc in the EW direction (H = 50). More quantitative results are obtained by separating the data into seven semi-annular groups. The results are shown in the table, where the outer radius of each annular region is indicated. Also included are the visual magnitude of each region obtained from the present g and r data, V, and the total contribution to the light in each region by galaxies brighter than $V_{25} = 18^{m}.0$, V_{25}. A comparison between the V and V_{25} magnitudes suggests that between 15 and 20 percent of the light of the cluster comes from galactic halos, faint galaxies, and the intergalactic medium (IGM).

R	g	r	V	V_{25}
0-6	$10^{m}.38 \pm 0.09$	$9^{m}.97 \pm 0.09$	$10^{m}.20$	$10^{m}.54$
6-12	11.24 ± 0.09	10.62 ± 0.08	10.98	11.09
12-18	11.45 ± 0.15	10.94 ± 0.14	11.23	11.37
18-24	11.59 ± 0.13	11.07 ± 0.12	11.37	11.36
24-30	13.04 ± 0.32	12.17 ± 0.22	12.69	12.27
30-36	14.53 ± 0.90	13.46 ± 0.58	14.11	13.52
36-42	14.23 ± 0.49	13.74 ± 0.45	14.03	14.51
0-24	9.55 ± 0.07	9.05 ± 0.07	9.34	9.53
0-42	9.48 ± 0.09	8.97 ± 0.08	9.26	9.41

An estimate of the true intergalactic luminosity can be obtained from our data alone by considering only the counts coming from regions well away from galaxies brighter than $V_{25} = 18.0$. The mean of both bands averaged over the seven regions considered above gives $L_{IGM}/L_{GAL} = 0.18 \pm 0.05$ which must be considered as an upper limit since much of the observed intergalactic light may still come from material which is bound to individual galaxies. It is concluded, therefore, that 25 percent is a conservative upper limit to the amount of light that might come from a true intergalactic background. If the cluster is bound by intergalactic material, this medium cannot consist of any usual stellar population.

REFERENCE

Melnick, J., White, S.D.M., and Hoessel, J.: 1977
M.N.R.A.S. 180, pp 207-218.

DISCUSSION

Ostriker: Do you have any information on the colour of the background light in comparison with the colour of the galaxies?

Materne: B-V is about 2 but with a very large error.

Abell: Is it consistent with the colour of galaxies, say B-V $\approx$ 1?

Materne: Within the errors, yes.

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