GALAXY LUMINOSITY FUNCTIONS, M/L RATIOS, AND CLOSURE OF THE UNIVERSE

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Data on the luminosity function (LF) of galaxies are reviewed and compared on a common magnitude system and with common assumptions. The result of Kirshner *et al.* (*Astron. J.* 88, 1285, 1983) is chosen as a best guess. Departures from this "standard LF" for specific galaxy types and environments (clusters, groups, field) are discussed briefly. If the Galactic absorption is $A_B = 0.2 \csc|b|$ and the solar absolute magnitude is $M_{B\odot} = 5.48$, this LF leads to a mean luminosity density $\mathcal{L} = 2.4 \times 10^8 h\ L_\odot\ Mpc^{-3}$ on the B_T system, or about $1.4 \times 10^{-2} h$ "Galaxies" Mpc^{-3}. The mean M/L ratio needed to give critical cosmological density ($\Omega_0 = 1$) is then 920h in solar units on the B_T^0 (face-on) system. [The latter number can be larger by a factor ~ 2 if a different LF is used, and larger still on different systems and with different assumptions (see Table).] The "weighed" M/L on this system is $\gtrsim (250 \pm 50)h$ in clusters, but it is smaller in binaries and small groups. Estimates of the weighed (clumped) Ω_0 vary, but it is definitely < 1. Comparison with constraints imposed by inflation and nucleosynthesis suggests that we distinguish at least two "dark-matter" problems: (1) What is the weighed mass, and how is it distributed? It contributes an $\Omega_0 \sim 0.1$–0.5 and could be all baryonic if at the lower end of this range. (2) Is there additional matter, more smoothly distributed and probably nonbaryonic, which brings Ω_0 up to unity? For details see *Comments on Astrophys.*, in press.

COMPARISON OF M/L RATIOS ON VARIOUS SYSTEMS
AND WITH VARIOUS ASSUMPTIONS

	If $A_B = 0$			If $A_B = 0.2 \csc\|b\|$		
Magnitude system	B(0)	B_T	"Face-on" B_T^0	B(0)	B_T	"Face-on" B_T^0
"Weighed" M/L (Great clusters)	(480±100)h	(380±80)h	(300±60)h	(400±80)h	(310±60)h	(250±50)h
Critical M/L to give $\Omega_0 = 1$, according to LF of:						
Kirshner *et al.*	1960h	1540h	1220h	1470h	1160h	920h
Davis & Huchra	2530h	1990h	1580h	1900h	1500h	1190h
Ellis	4430h	3480h	2770h	3330h	2620h	2080h

J. Kormendy and G. R. Knapp (eds.), Dark Matter in the Universe, 111.