ASTR 400B Homework 3 Table and Answers

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1 Table

Table 1: This is the table for halo mass, disk mass, bulge mass, total mass and f_{bar}. The galaxies involved are MW, M31, M33, and the local group.

Galaxy Name	Halo Mass ($10^{12} M_\odot$)	Disk Mass ($10^{12} M_\odot$)	Bulge Mass ($10^{12} M_\odot$)	Total Mass ($10^{12} M_\odot$)	f_{bar}
MW	1.975	0.075	0.01	2.06	0.041
M31	1.921	0.12	0.019	2.06	0.067
M33	0.187	0.009	0	0.196	0.046
Local Group	4.083	0.204	0.029	4.316	0.054

2 Answer to Questions

Questions relating to table above.

1)Compare total mass of MW and M31 / What galaxy component dominates the total mass?

-MW and M31 have the same total mass of 2.06 $10^{12} M_\odot$. For both galaxies the halo component dominates the total mass.

2)How does the stellar mass of MW and M31 compare? Which galaxy is more Luminous?

-M31 has a stellar mass of 0.139 $10^{12} M_\odot$ while MW has a stellar mass of 0.085 $10^{12} M_\odot$. M31 has more stellar mass and would be more luminous than the MW.

3)How does the total dark matter mass of MW and M31 compare?

-$\frac{MW(HaloMass)}{M31(HaloMass)} = 1.028$. This is surprising because MW has more dark matter than M31 but M31 has more stellar mass. I would expect M31 to have

more dark matter because it has more stellar mass.

4)Ratio of Stellar Mass to Total mass for each galaxy (f_{bar}). (For Universe: $\frac{\Omega_b}{\Omega_m} = 16\%$)

-MW= 0.041 (4.1%), M31= 0.067 (6.7%), M33=0.046 (4.6%). The galaxy's baryon fraction is a lot lower than 16%. This is probably due to the fact that we are looking at only three galaxies while in reality there are a lot more than 3 galaxies in the universe. Some of these could have a lot more stellar mass than MW, M31, or M33 and each galaxy has its own amount of dark matter. Averaging all of the baryon fractions for all of the galaxies could change the ratio.