# Homework 3 on ASTR400B

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## 1 Output Table: Mass Break Down of Local Group

| Name | $M_{Halo}$ $1 \times 10^{12}\,\mathrm{M}_\odot$ | $M_{Disk}$ $1 \times 10^{12}\,\mathrm{M}_\odot$ | $M_{Bulge}$ $1 \times 10^{12}\,\mathrm{M}_\odot$ | $M_{Total}$ $1 \times 10^{12}\,\mathrm{M}_\odot$ | $f_{bar}$ |
|---|---|---|---|---|---|
| M31 | 1.921 | 0.12 | 0.019 | 2.06 | 0.068 |
| M33 | 0.187 | 0.009 | 0.0 | 0.196 | 0.047 |
| MW | 1.975 | 0.075 | 0.01 | 2.06 | 0.041 |
| Galaxy Group | 4.082 | 0.204 | 0.029 | 4.316 | 0.054 |

Table 1: Mass break down of local group (snapnumber: 0)

## 2 Answers to The Questions on Homework 3

- The total mass of MW and M31 are the same in this simulation, the mass is dominated by dark matter halo, which composes 93.25% of M31 and 95.87% of MW.
- The stellar mass of M31 is more than MW on both disk and bulge components, and the baryon fraction of M31 is 65.85% higher than the MW's. This indicates that M31 should have a higher luminosity, providing these two galaxy have similiar stellar population.
- The dark matter of MW is only 2.81% more than M31's. Given the dominating fraction the dark matter takes, the little difference is understandable. The difference in stellar mass may be a result of different assembly history.
- The baryon fraction of M31, M33 and MW are 6.8%, 4.7% and 4.1%, which is much lower than the average fraction 16%. If the mass of gas in the disk in negligible compared to the stellar mass, the "missing baryons" may hide in non-luminous IGM, low-luminosity dwarfs or white dwarfs