

Hierarchical Galaxy Formation

1. Dark matter halos start to form early provided the dark matter is

- 1- cold (slow moving)
- 2- does not interact with photons

They start small.

2. Baryons fall into the potential wells provided by nascent dark matter halos

- this can't happen before $z \approx 200$ because the baryons are thermally coupled to the cosmic radiation field (the CMB) until that time ("decoupling")

3. Gas dissipates, condenses to centers of halos

- compresses halos
- forms disks

4. Stars form in disks

- feedback from star formation may re-heat gas and stop further star formation

5. Halos grow by successive mergers

- star formation truncated by merger (maybe sometimes with a burst)
- disks destroyed; transformed into elliptical galaxy

6. Accretion continues

- disks may re-form, resulting in disk + bulge structure

7. Merging subsides (around $z \approx 1$ in Λ CDM)

- gradual, more gentle accretion of both dark matter and intergalactic gas may continue

