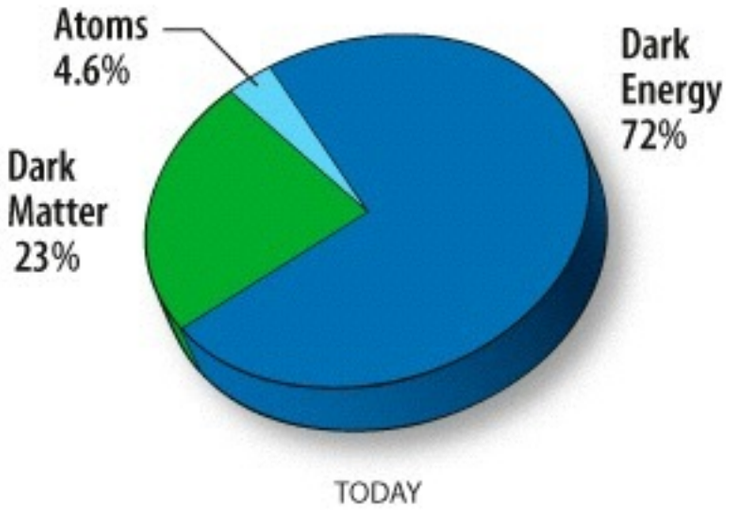
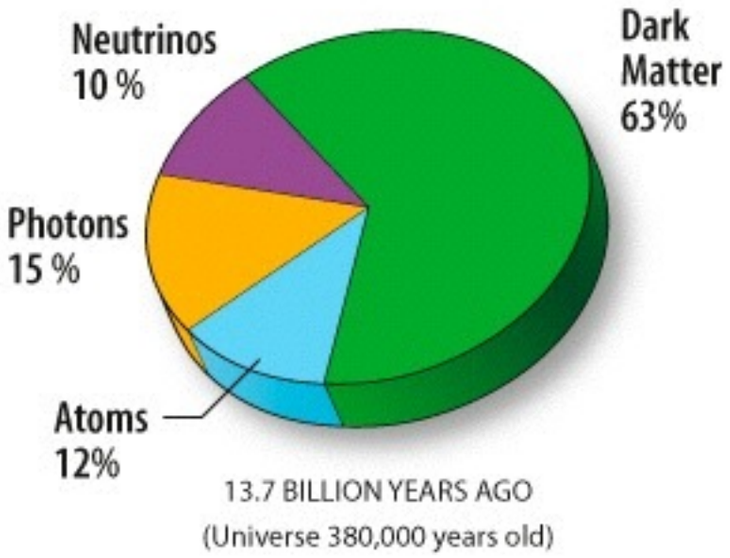
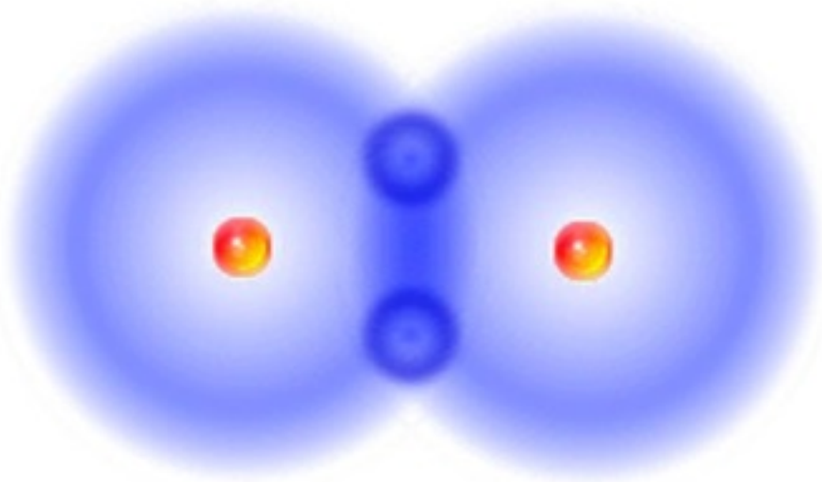
The Illustris Project
(a quick tutorial)

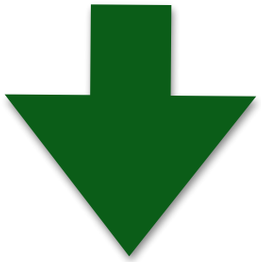
http://www.illustris-project.org/

http://www.illustris-project.org/w/index.php/Main_Page



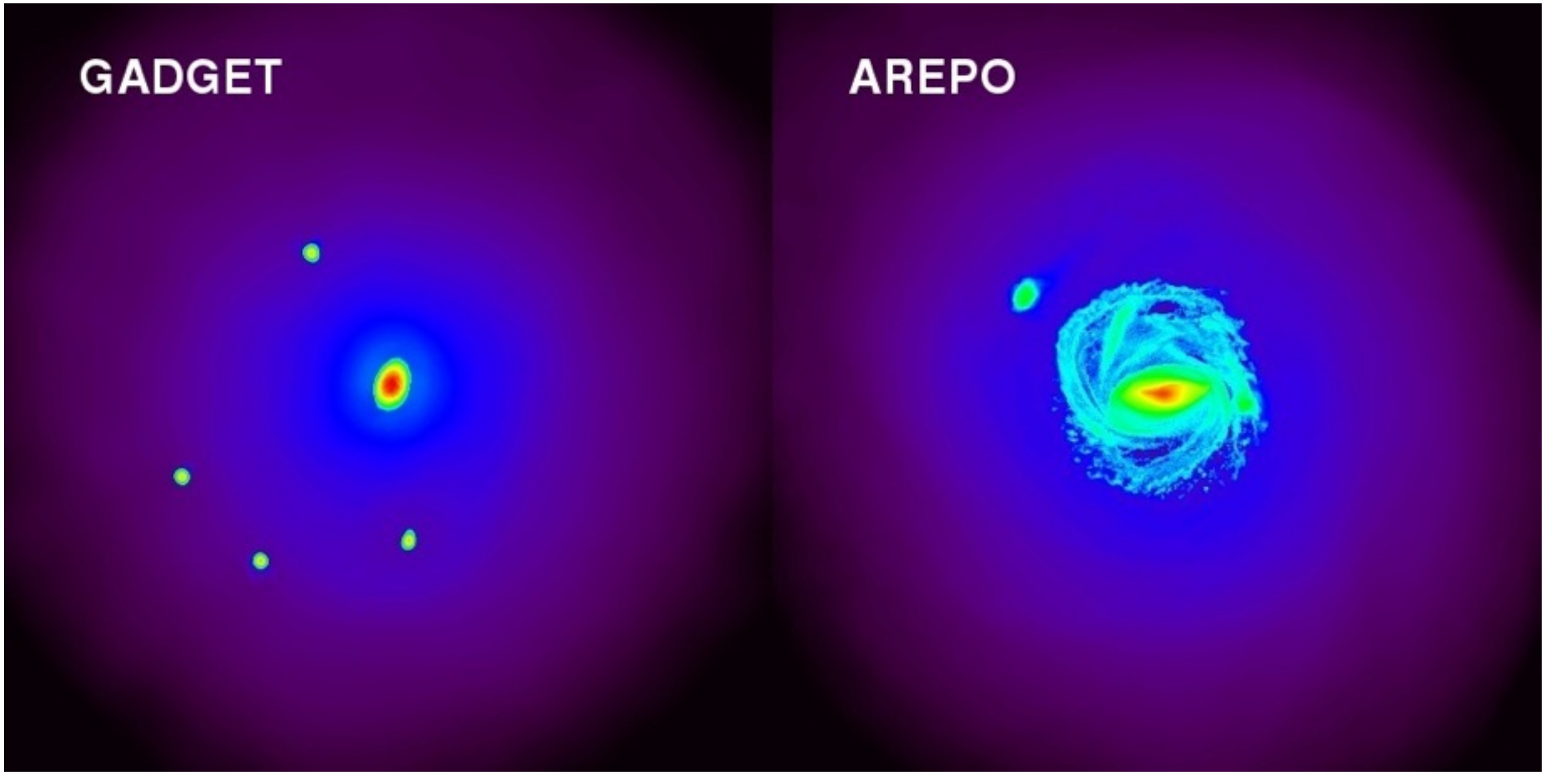






~10^{30} order of magnitude

strategy: Discretize the universe into resolution elements and solve the equations of motion for each element



http://www.mpa-garching.mpg.de/~volker/arepo
http://www.cfa.harvard.edu/itc/research/movingmeshcosmology

- gravity
- gas cooling & photoionization
- star formation & ISM
- stellar evolution
- stellar & AGN feedback

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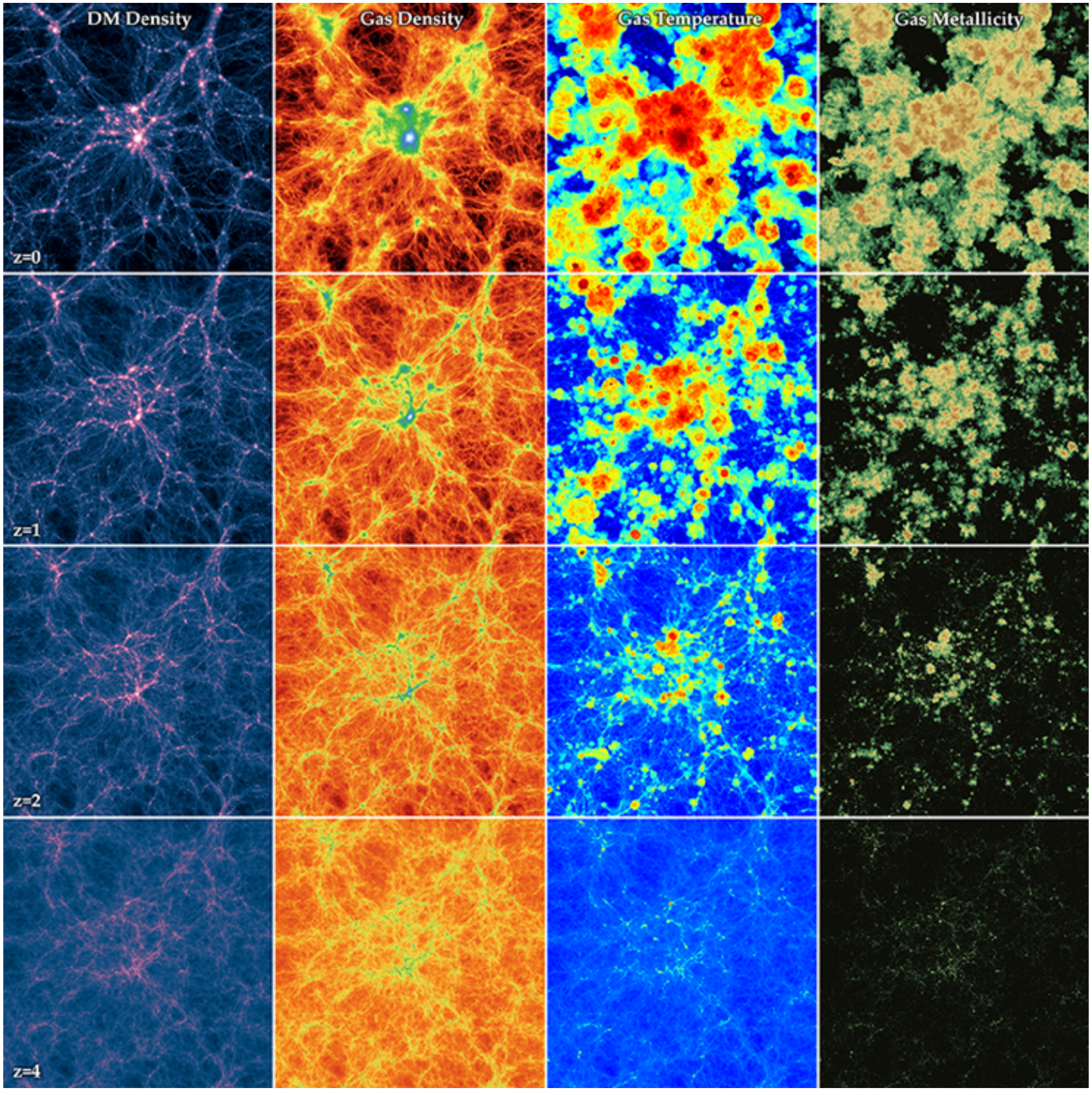
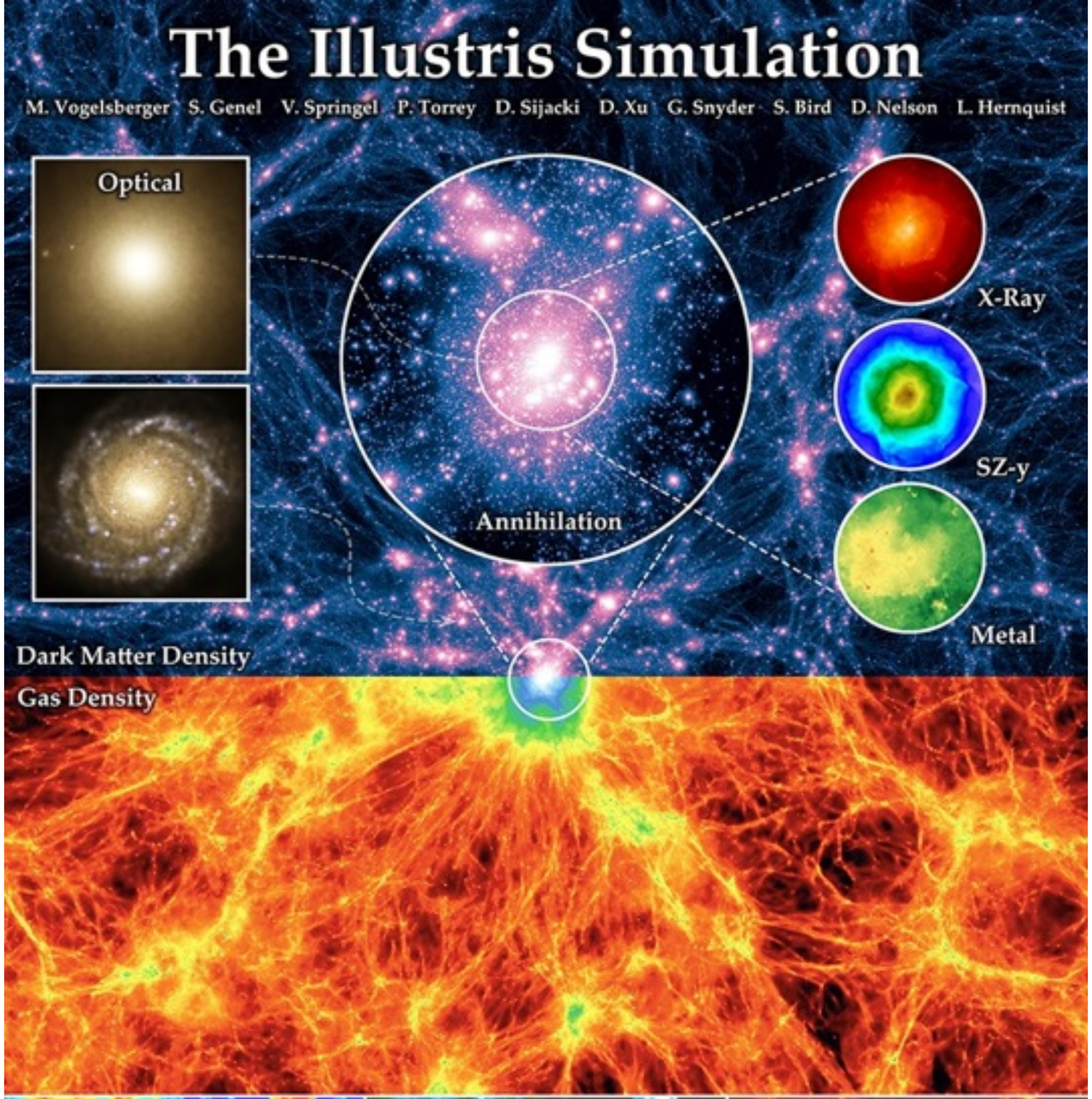
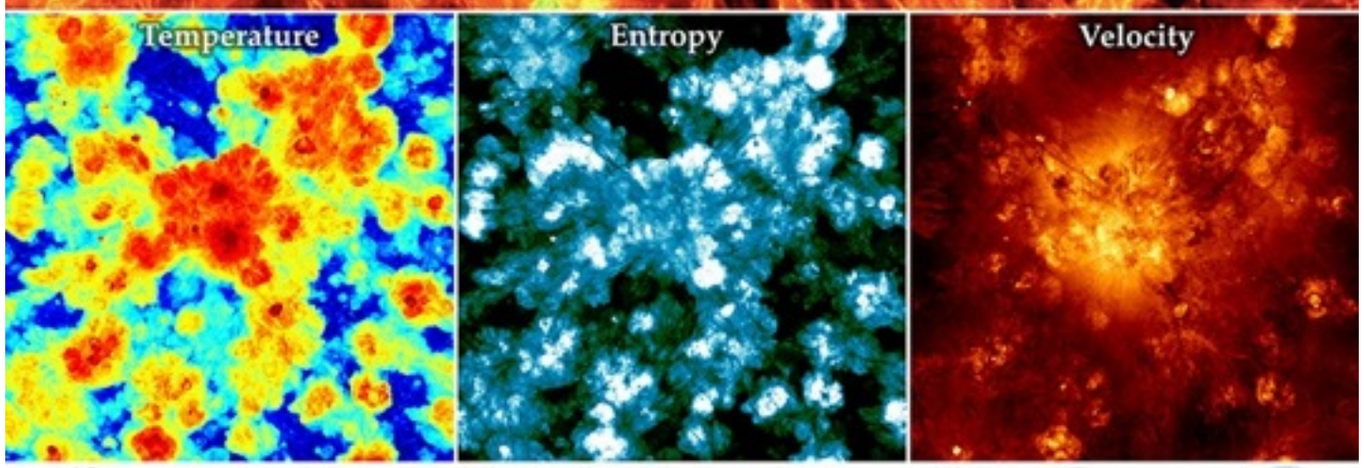

DM Density
Gas Density
Gas Temperature
Gas Metallicity
z=0
z=1
z=2
z=4

The Illustris Simulation

M. Vogelsberger S. Genel V. Springel P. Torrey D. Sijacki D. Xu G. Snyder S. Bird D. Nelson L. Hernquist





- Snapshot file (136 in total, from z=127 to z=0)
- Subfind catalogue (1 per snapshot)
- Merger Tree (1 in total)

DM Density
z=0
z=1
z=2
z=4

Subfind file

```
import numpy as np
import matplotlib as plt
import readsubfHDF5

# Read catalog
basedir = <INSERT HERE THE PATH TO THE SIMULATION>
snapid = 135
catalog = readsubfHDF5.subfind_catalog (basedir, snapid)
```

www.astro.wisc.edu/~ciro/illustris-cosmology

/d/sierra3/astro735/Illustris-3/

Setting the masses

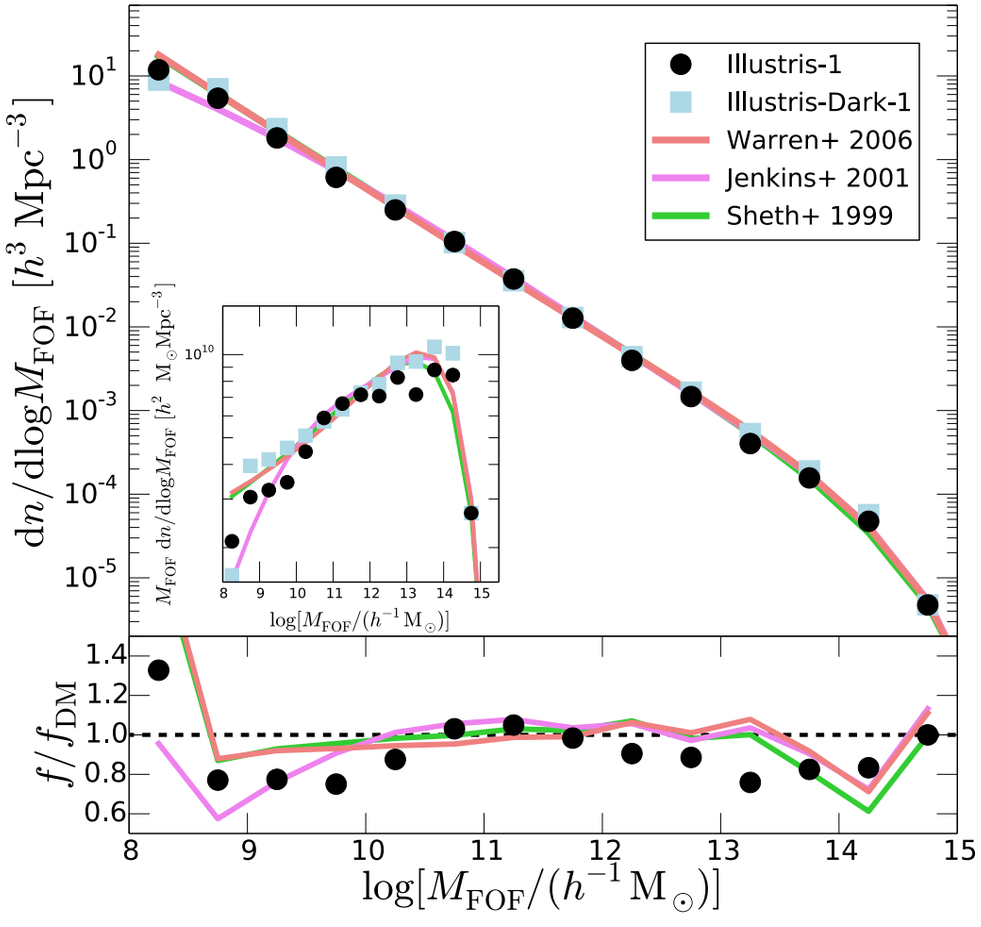
```
# Set masses
mFOF = catalog.Group_M_Crit200
mFOF *= 1.e10

i = np.nonzero ((mFOF > 1.e10))[0]
mFOF = mFOF[i]
logmFOF = np.log10 (mFOF)
```

Mass function

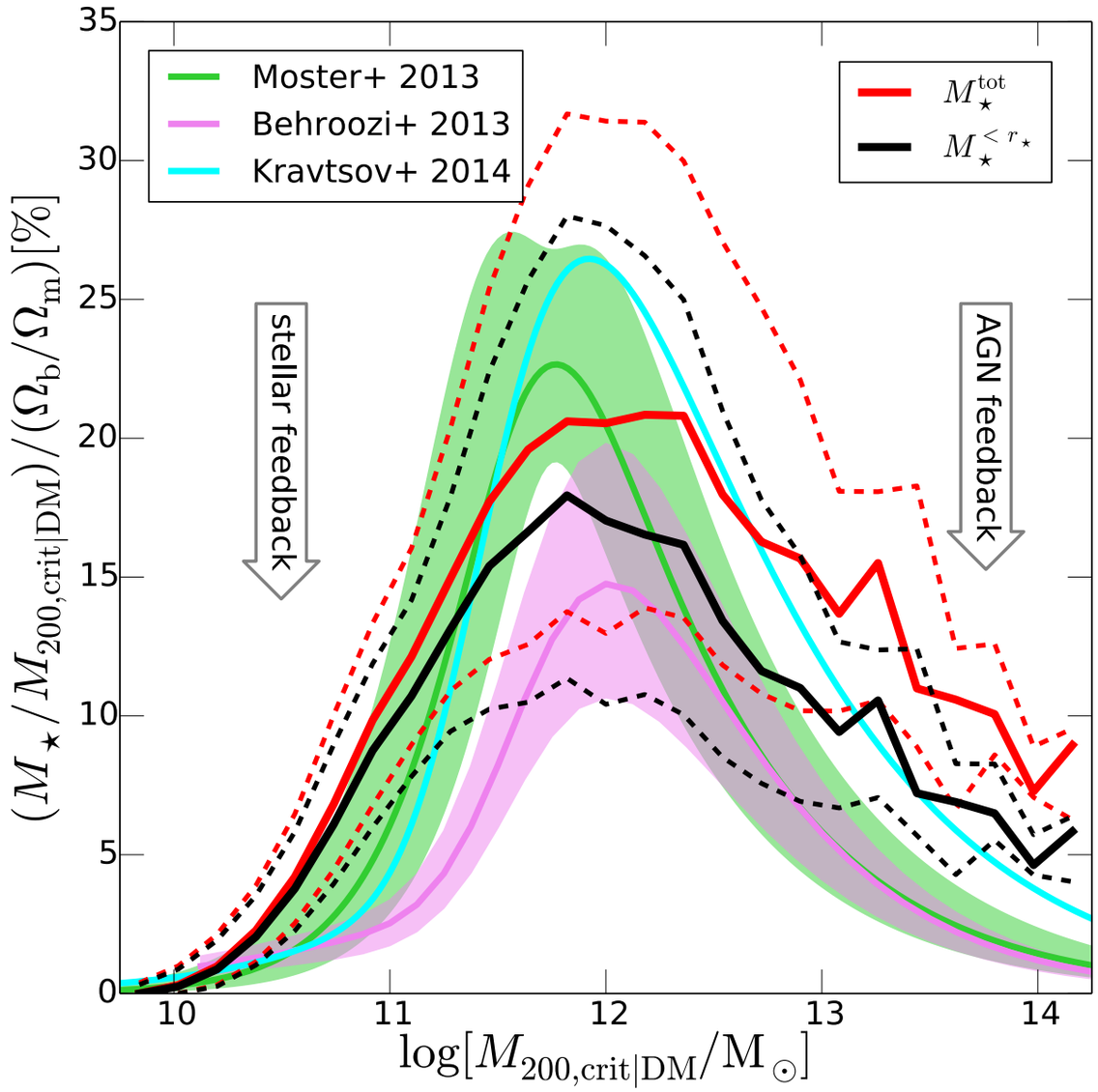
```
# Histogram
h, x = np.histogram (logmFOF, bins=32, range=[10,15],
    density=True)
x = x[0 : len(h)] + 0.5 * (x[1] - x[0])
```

And finally …

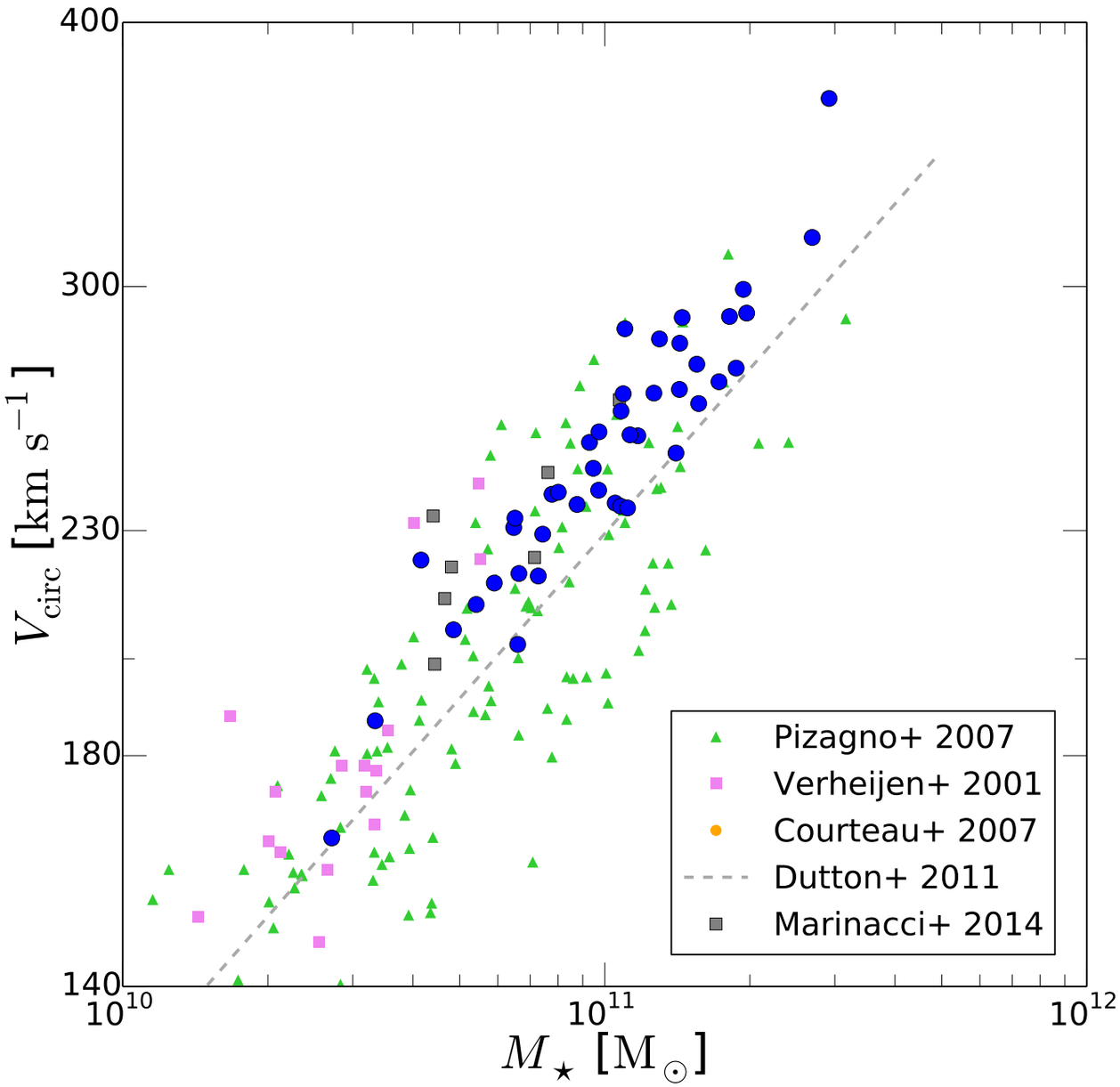
```
# Plot
plt.plot (x, np.log10 (h),'b-')
```



Stellar formation efficiency



Tully-Fischer



Suggestions

- The topology of the cosmic web
- Virialization of clusters
- Stellar streams
- …