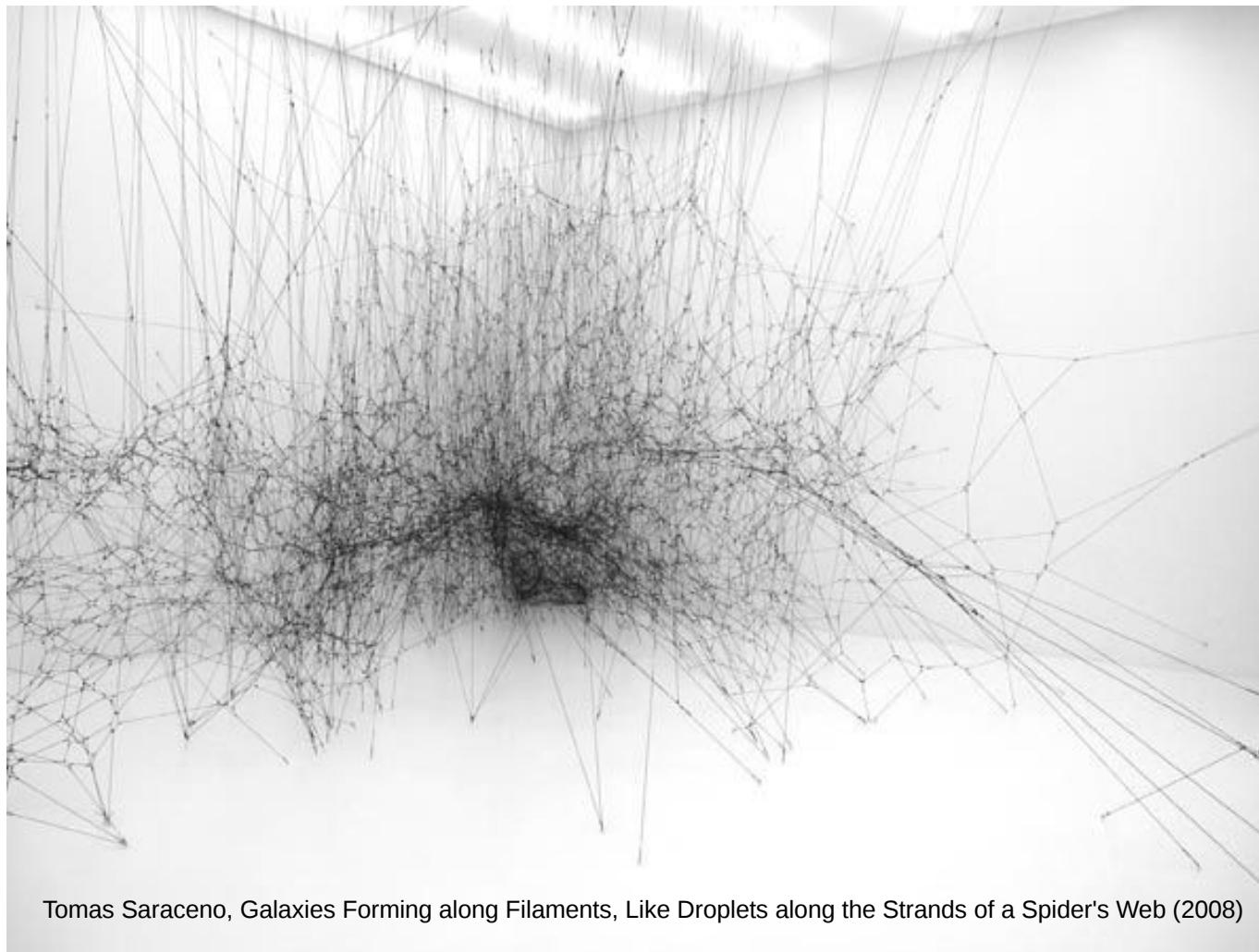


Ayudando a construir el mejor mapa del Universo



El mejor mapa del Universo – J. Forero-Romero

```

Dir[i] = DirIn[i];
}

x = *x_in;

stat = *status;
/*difuse the photon in space and frequency until it gets out*/
while(PropagateIsInside(&(Pos[0]))&&(stat==ACTIVE)&&n_iter<MAX_ITER){
    /* get the temperature at this point*/
    PropagateGetTemperature(&temperature, Pos);

    /* get the number density at this point*/
    PropagateGetNumberDensity(&n_HI, Pos);

    /*get the bulk velocity of the fluid at this point*/
    PropagateGetBulkVel(BulkVel, Pos);

    /*Get the thermal velocity and doppler broadening*/
    nu_doppler = CONSTANT_NU_DOPPLER*sqrt(temperature/10000.0); /* in cm/s */
    a = Ly_a_nu_line_width_CGS/(2.0*nu_doppler);
    v_thermal = (nu_doppler/Ly_a_nu_center_CGS)*C_LIGHT; /*In cm/s*/

    /*change the value of the frequency to one comoving with the fluid*/
    PropagateLorentzFreqChange(&x, Dir, BulkVel, v_thermal, -1);

    /*change the direction of the photon to the fluid frame*/
    PropagateLorentzDirChange(&(Dir[0]), BulkVel, -1);

    /*
    /*Change the frequency and the Propagation direction, find the displacement*/
    stat = PropagateStep(&x, Dir, &r_travel, a, n_HI);
    /*
    */

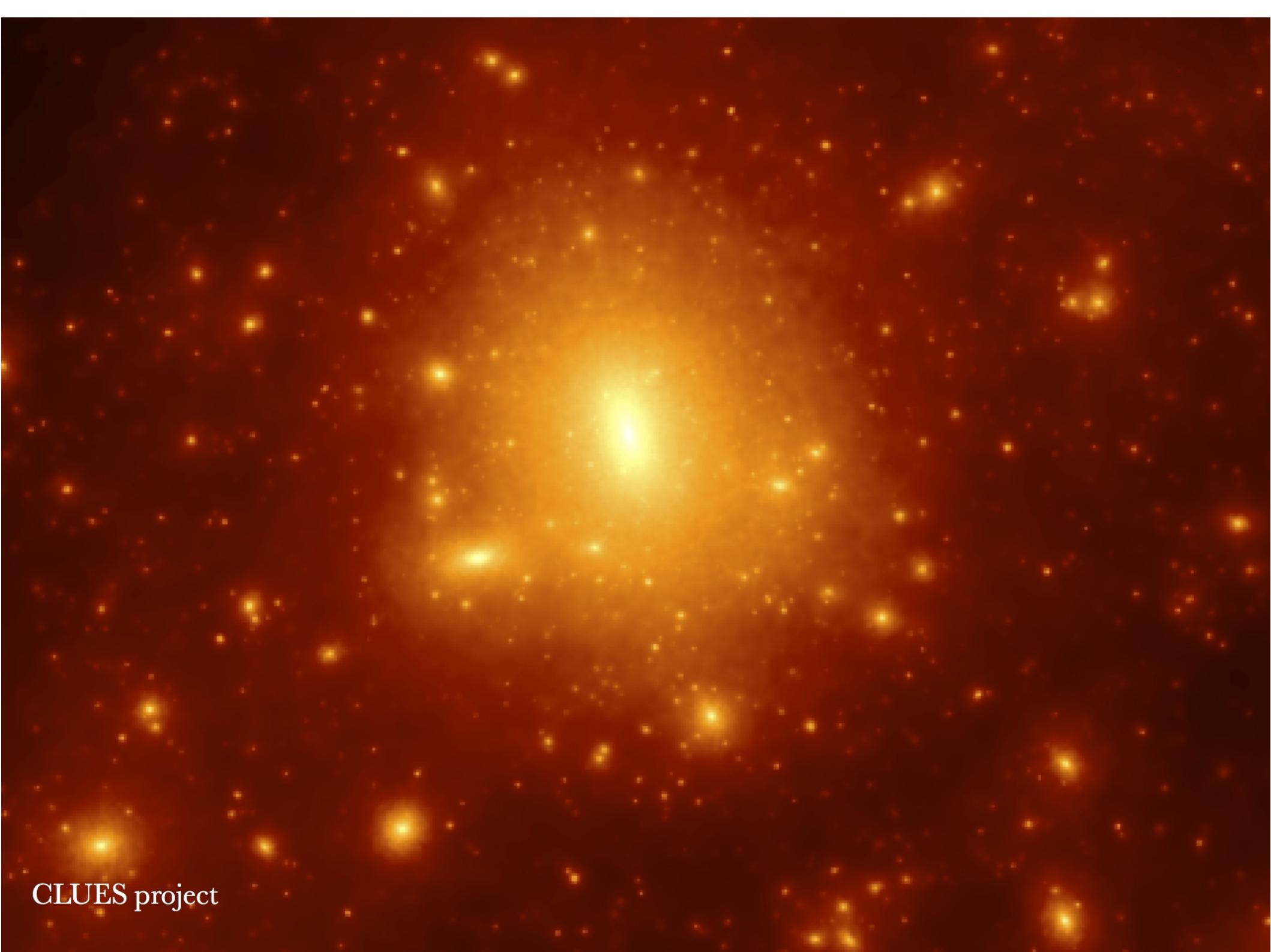
    /*Change the new direction to the lab frame value*/
    PropagateLorentzDirChange(Dir, BulkVel, 1);

    /*Change the frequency comoving to the lab frame value*/
    PropagateLorentzFreqChange(&x, Dir, BulkVel, v_thermal, 1);
}

```



Image Credit & Copyright: Wally Pacholka (AstroPics.com, TWAN)

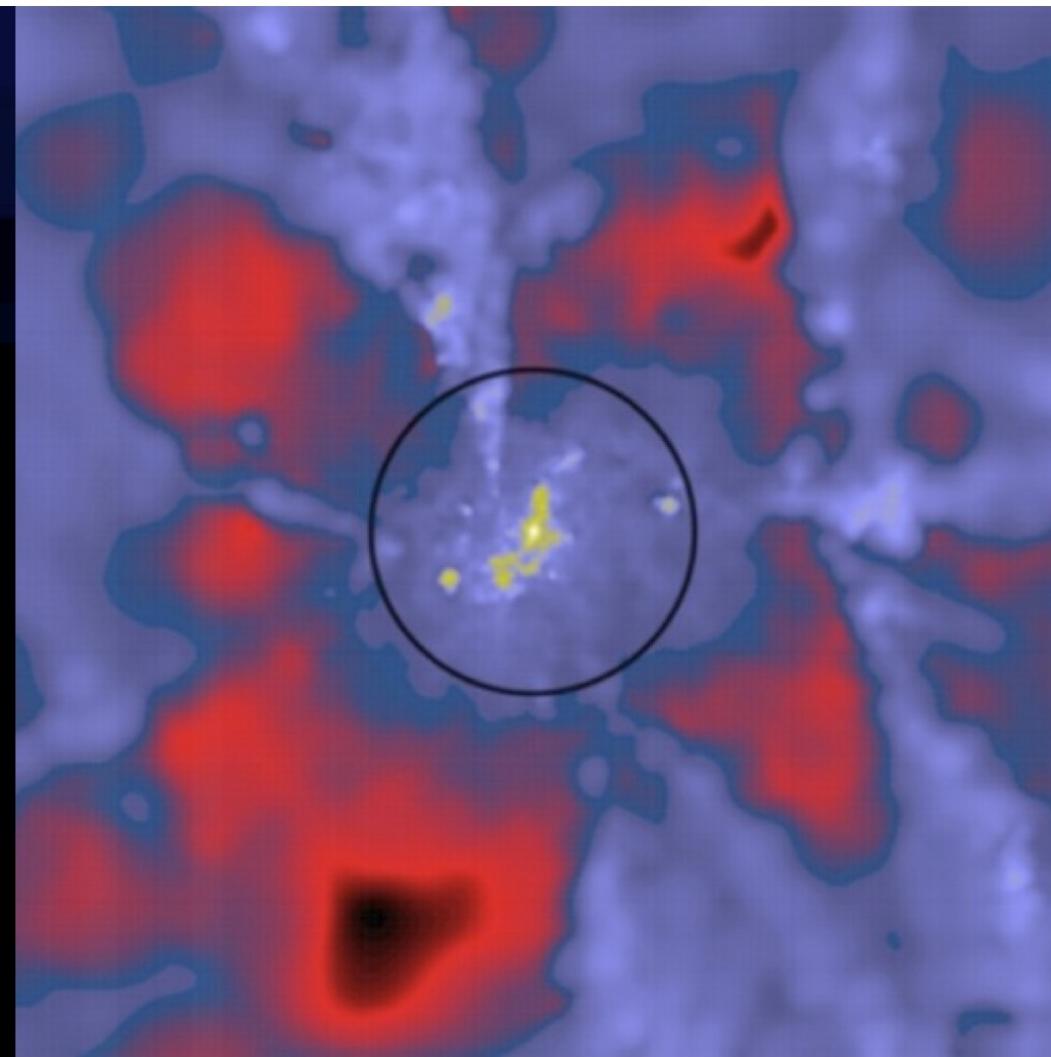


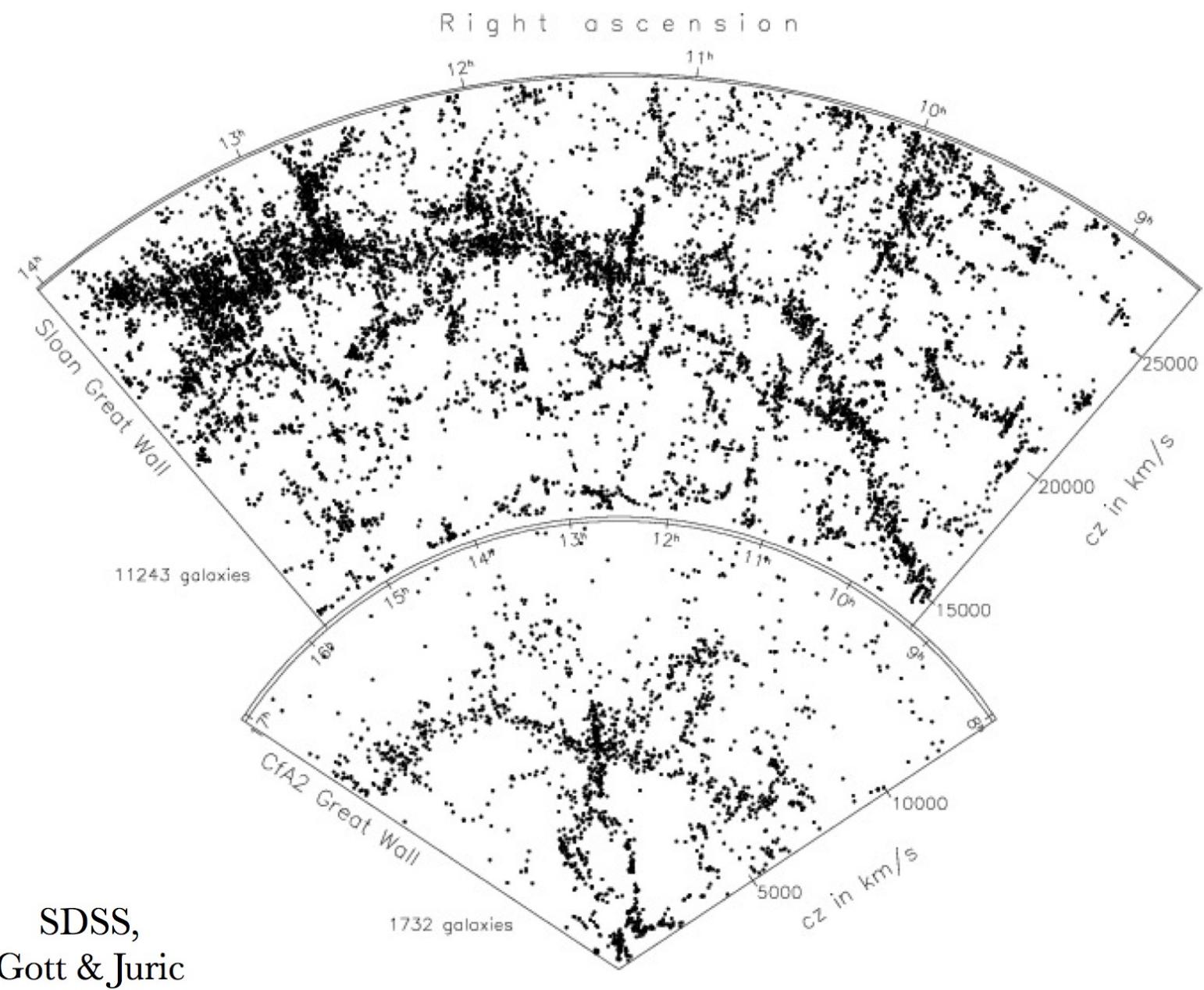
CLUES project

Himiko

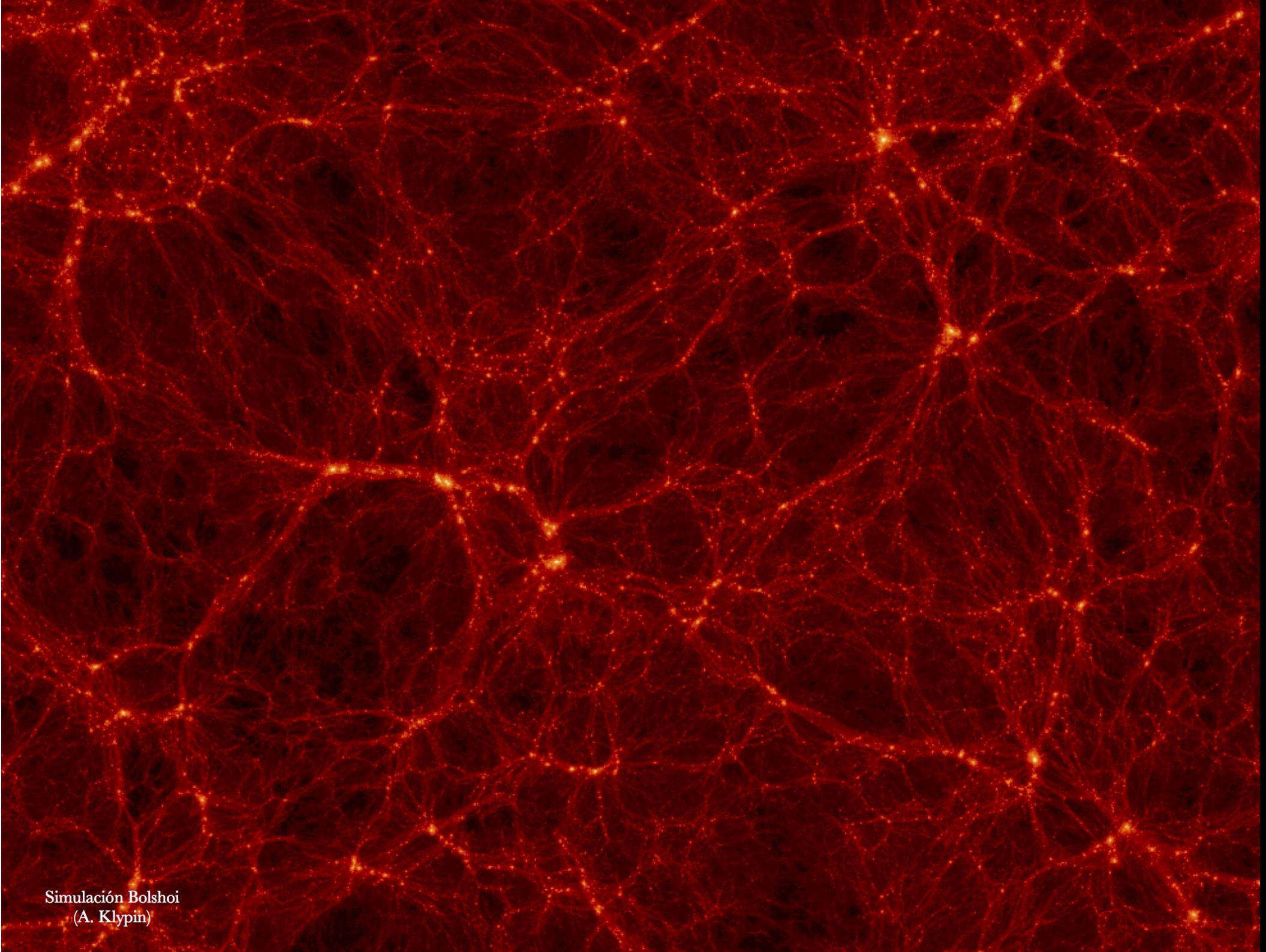
10 kly

Keck Observatory



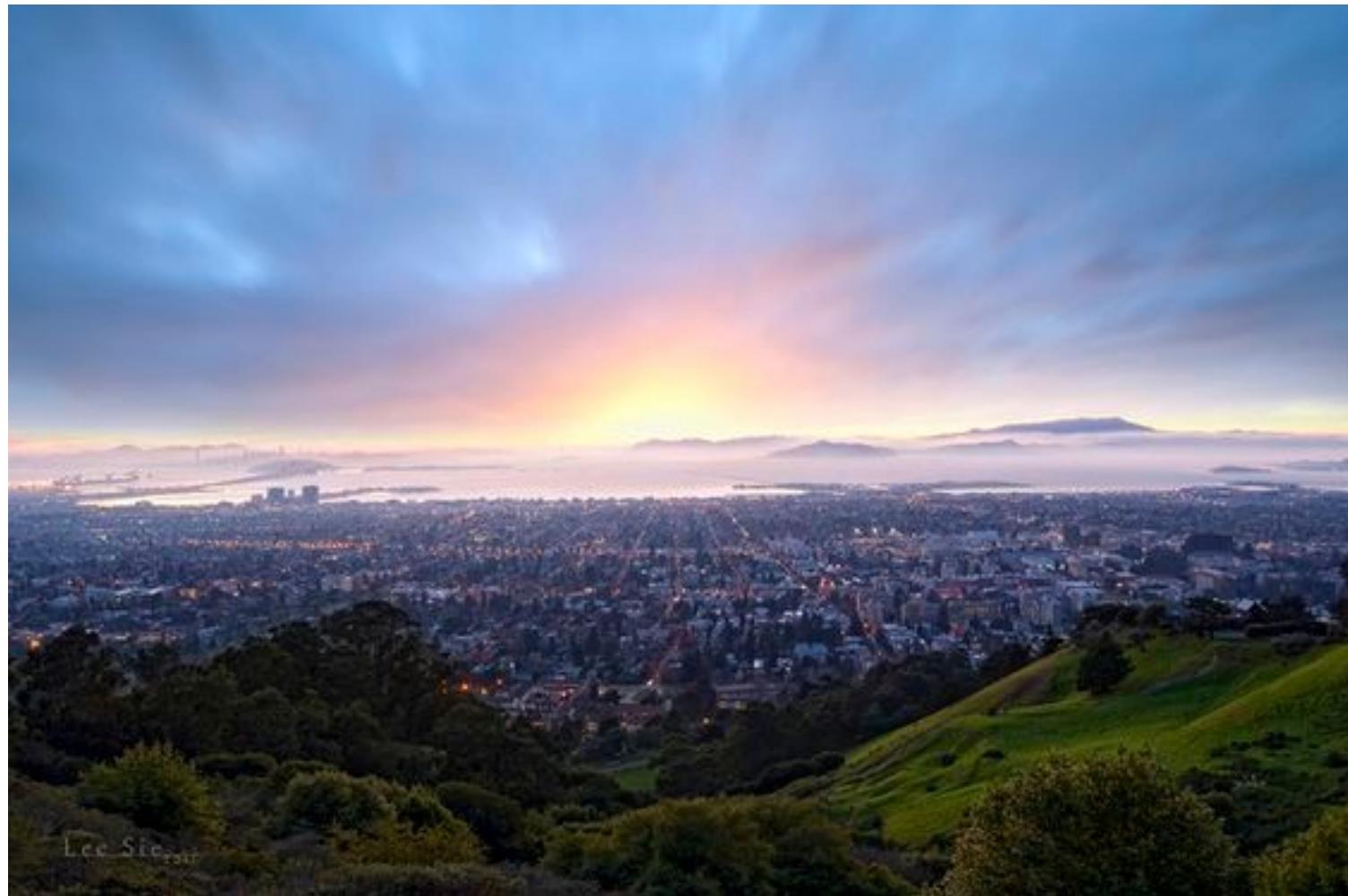


SDSS,
Gott & Juric



Simulación Bolshoi
(A. Klypin)

Una semana de trabajo en Berkeley



El mejor mapa del Universo – J. Forero-Romero

5038



Saul Perlmutter

ASTROPHYSICS

El mejor mapa del Universo – J. Forero-Romero

The Nobel Prize in Physics 2011



Photo: U.
Montan

**Saul
Perlmutter**
Prize share: 1/2



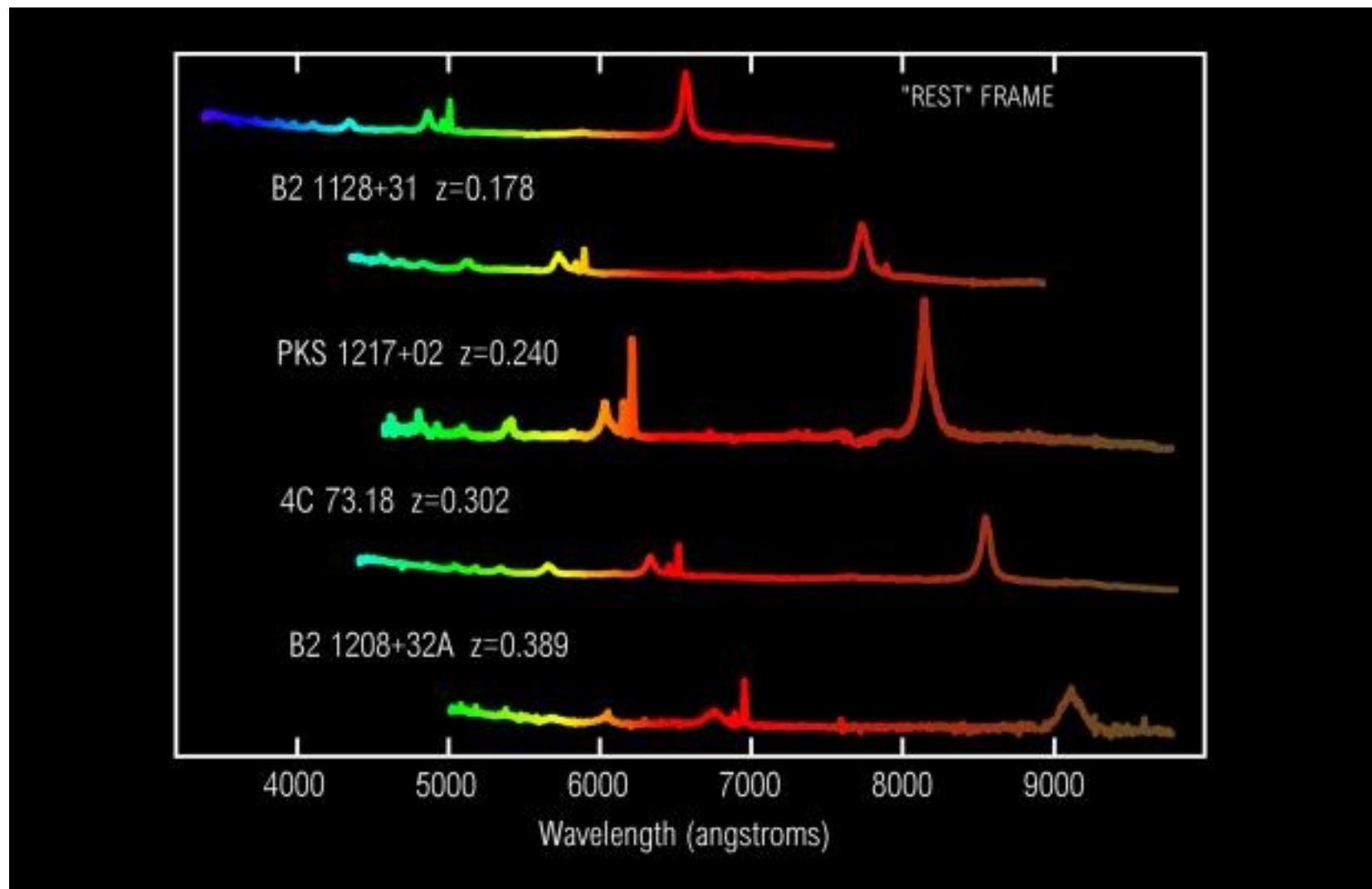
Photo: U.
Montan

**Brian P.
Schmidt**
Prize share: 1/4



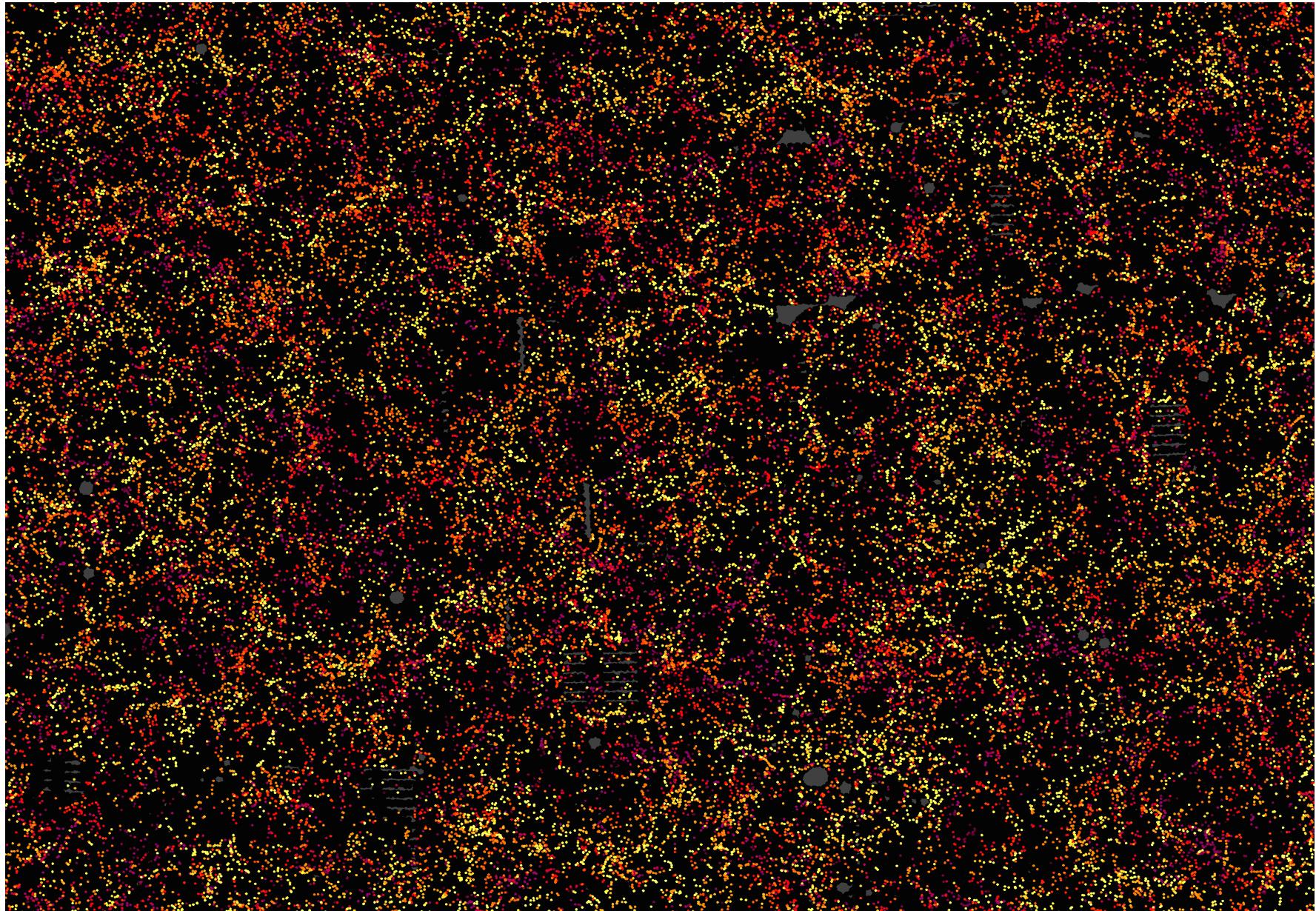
Photo: U.
Montan

**Adam G.
Riess**
Prize share: 1/4



NOAO

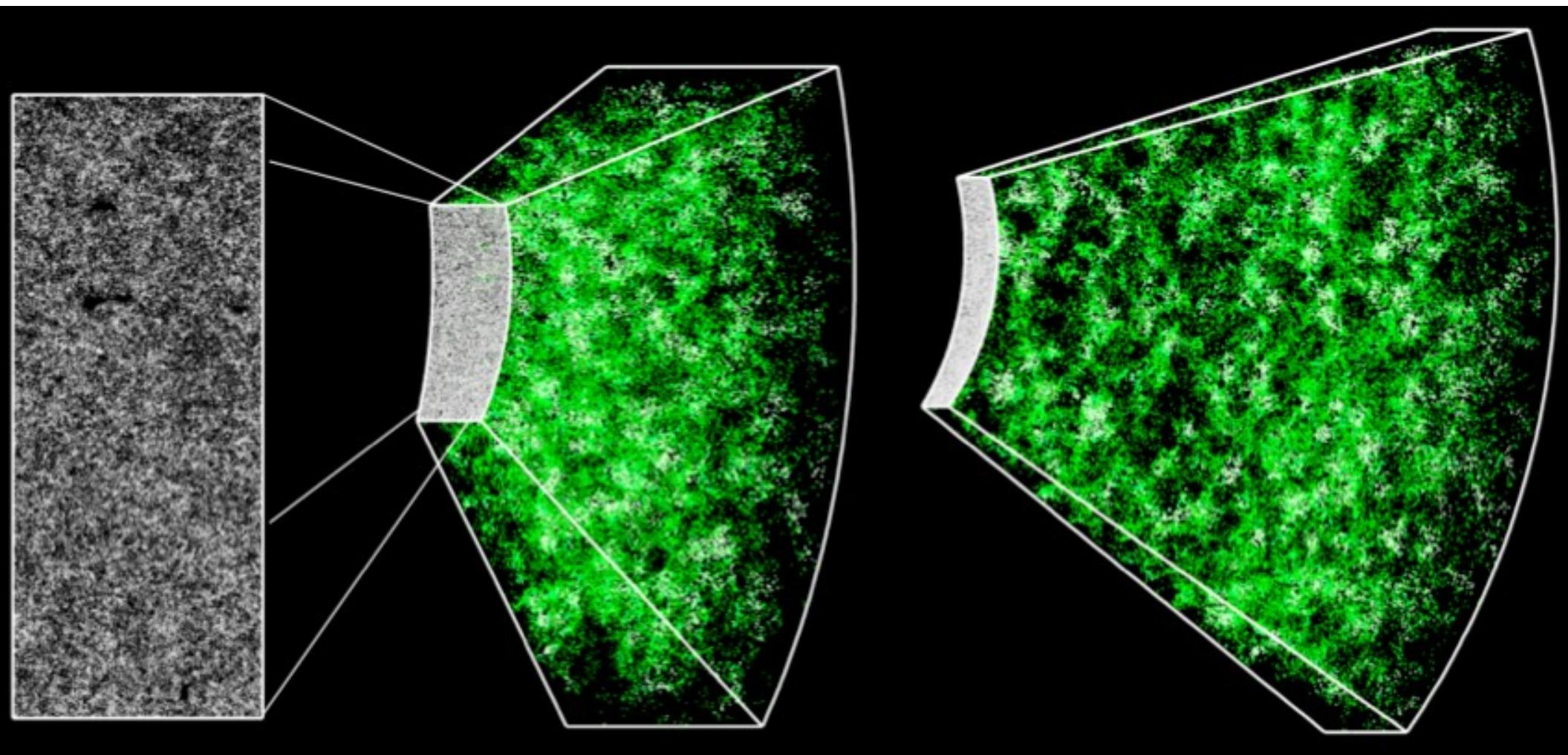
<http://newscenter.lbl.gov/2016/07/14/record-breaking-map-1-2-million-galaxies/>



El mejor mapa del Universo – J. Forero-Romero

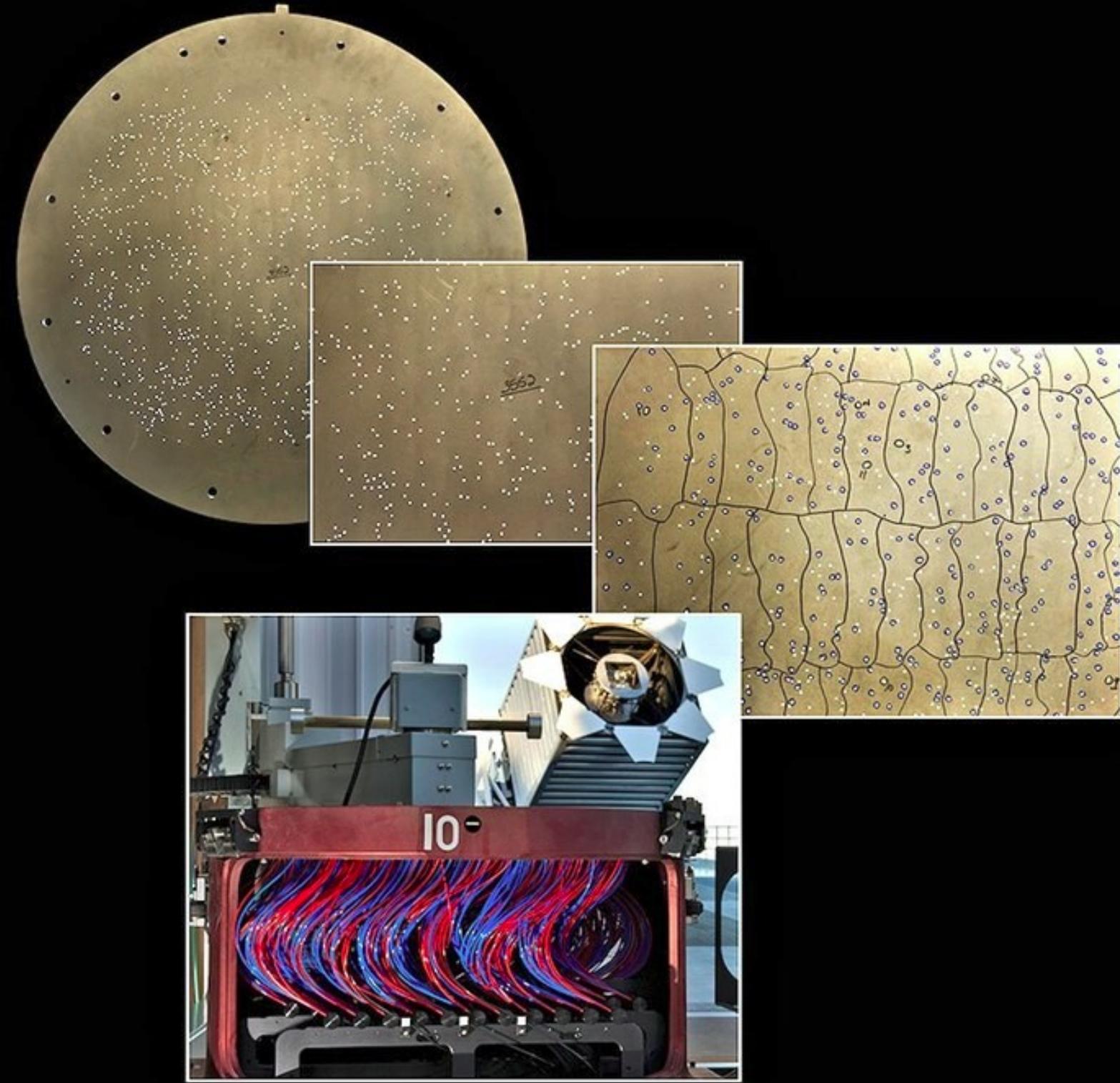
Daniel Eisenstein – SDSS III

<http://newscenter.lbl.gov/2016/07/14/record-breaking-map-1-2-million-galaxies/>

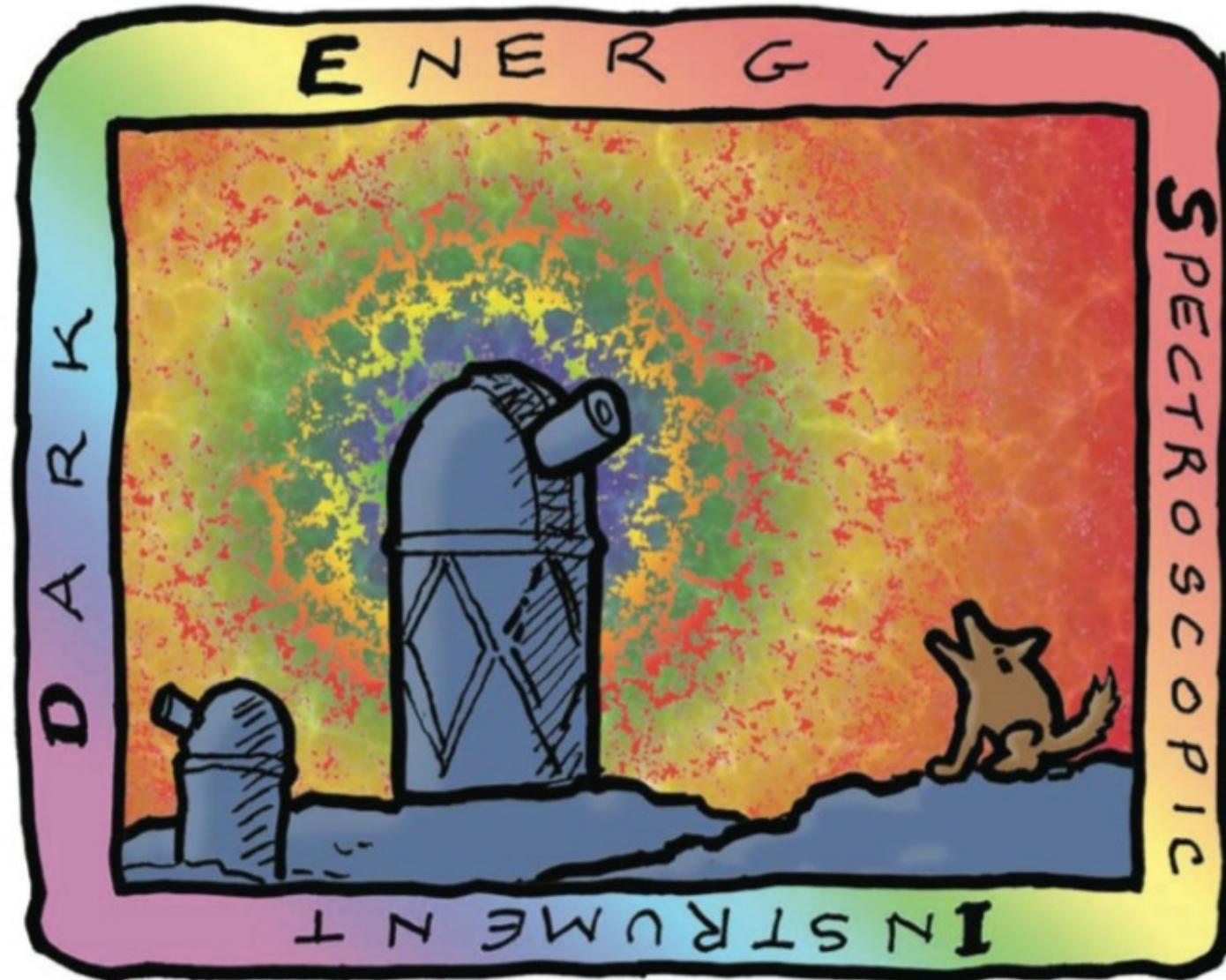


Jeremy Tinker – SDSS III

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SDSS

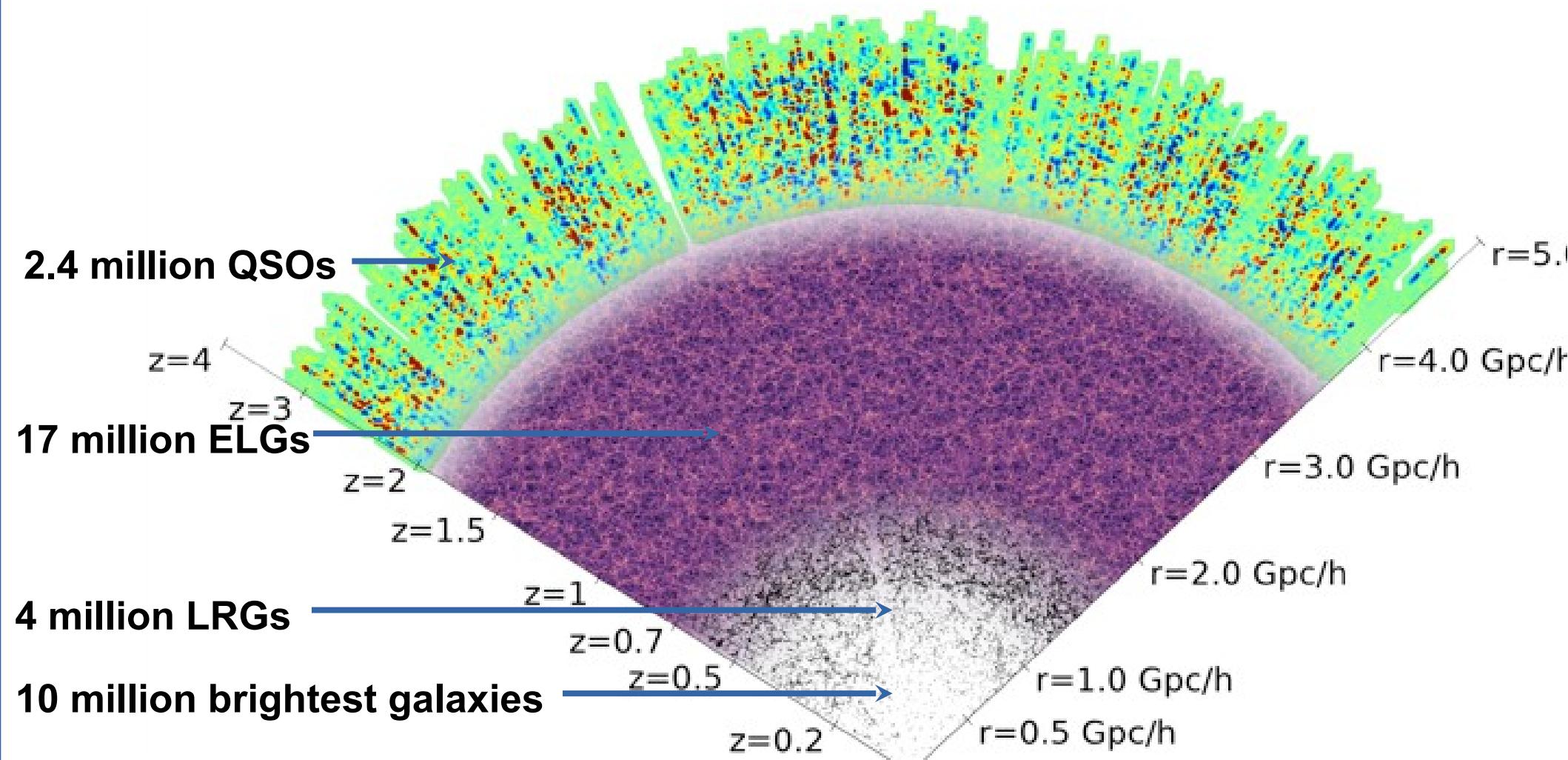


El mejor mapa del Universo – J. Forero-Romero

What is the DESI survey?

The largest spectroscopic survey for dark energy

SDSS $\sim 2 \text{h}^{-3}\text{Gpc}^3$ \rightarrow BOSS $\sim 6 \text{h}^{-3}\text{Gpc}^3$ \rightarrow DESI $50 \text{h}^{-3}\text{Gpc}^3$

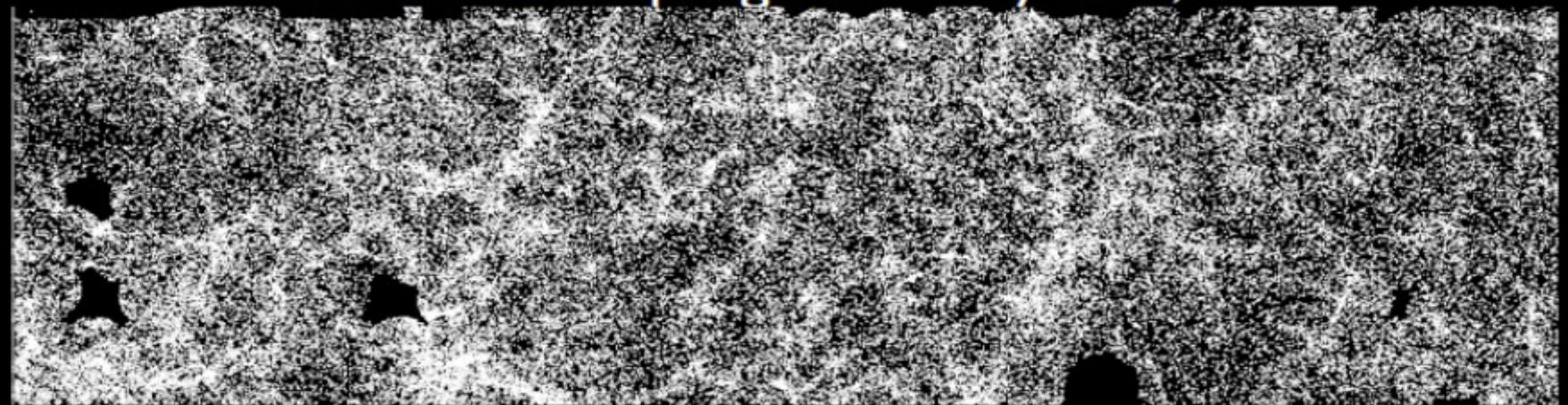


Courtesy: David Schlegel, LBNL

BOSS's sampling of density field, $z \sim 0.3$



DESI-BGS sampling of density field, $z \sim 0.3$



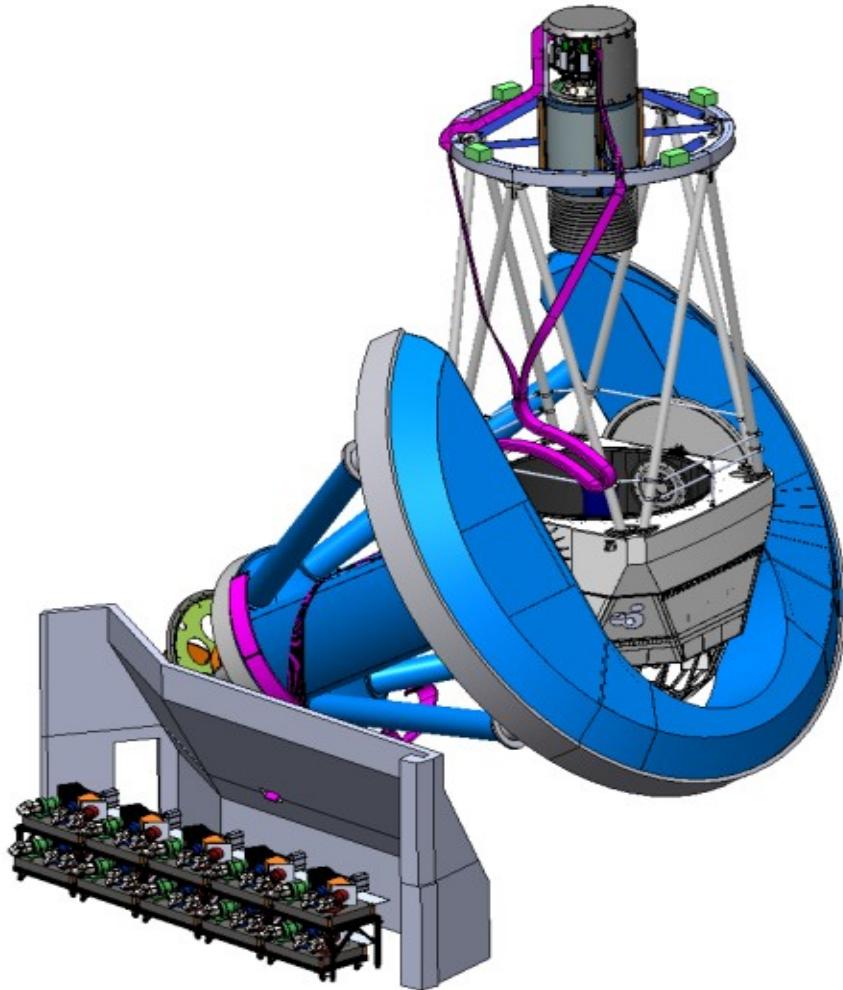
DESI se hará desde Kitt Peak



Nature

El mejor mapa del Universo – J. Forero-Romero

5000 mil fibras ópticas van a ser posicionadas por robots

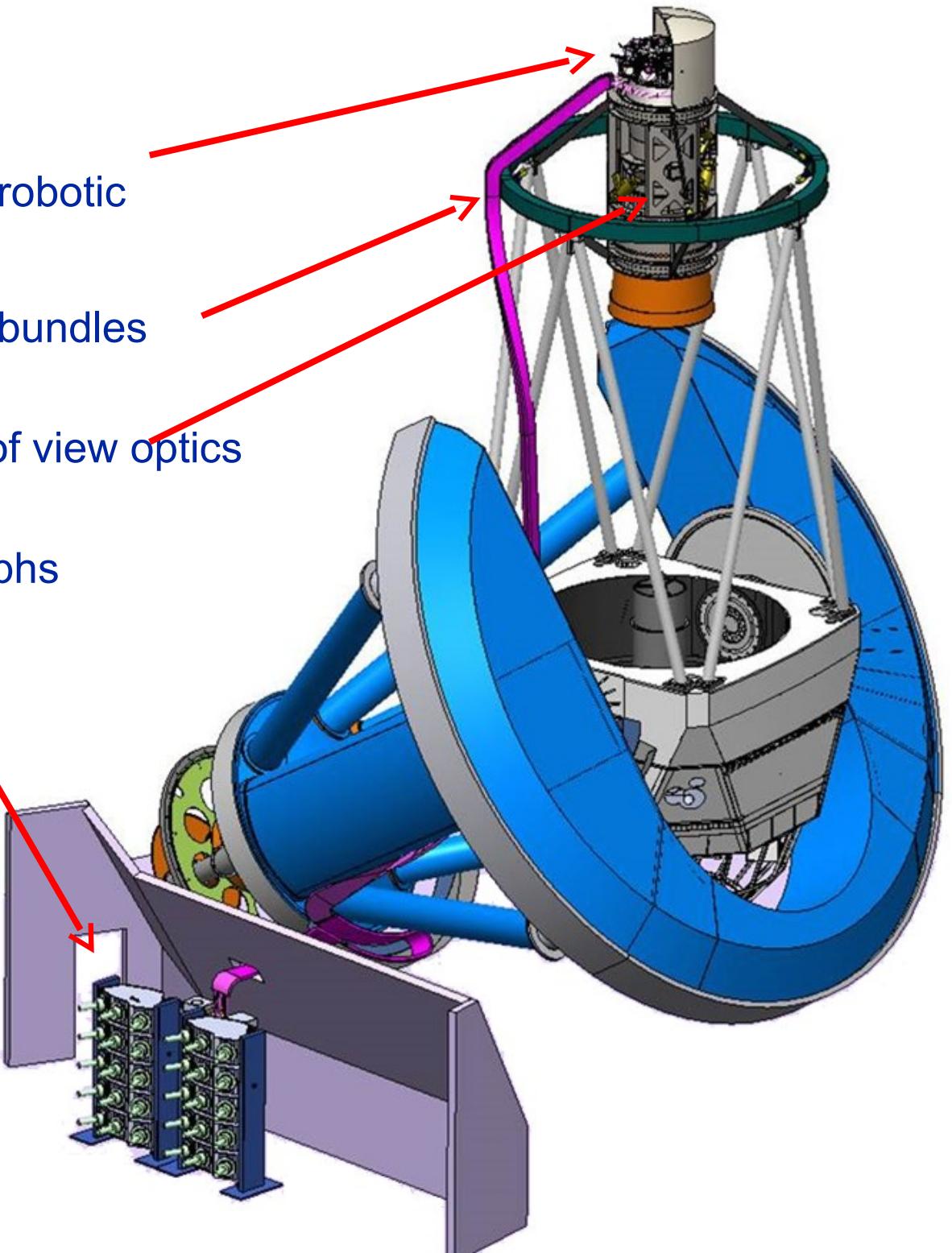


El mejor mapa del Universo – J. Forero-Romero

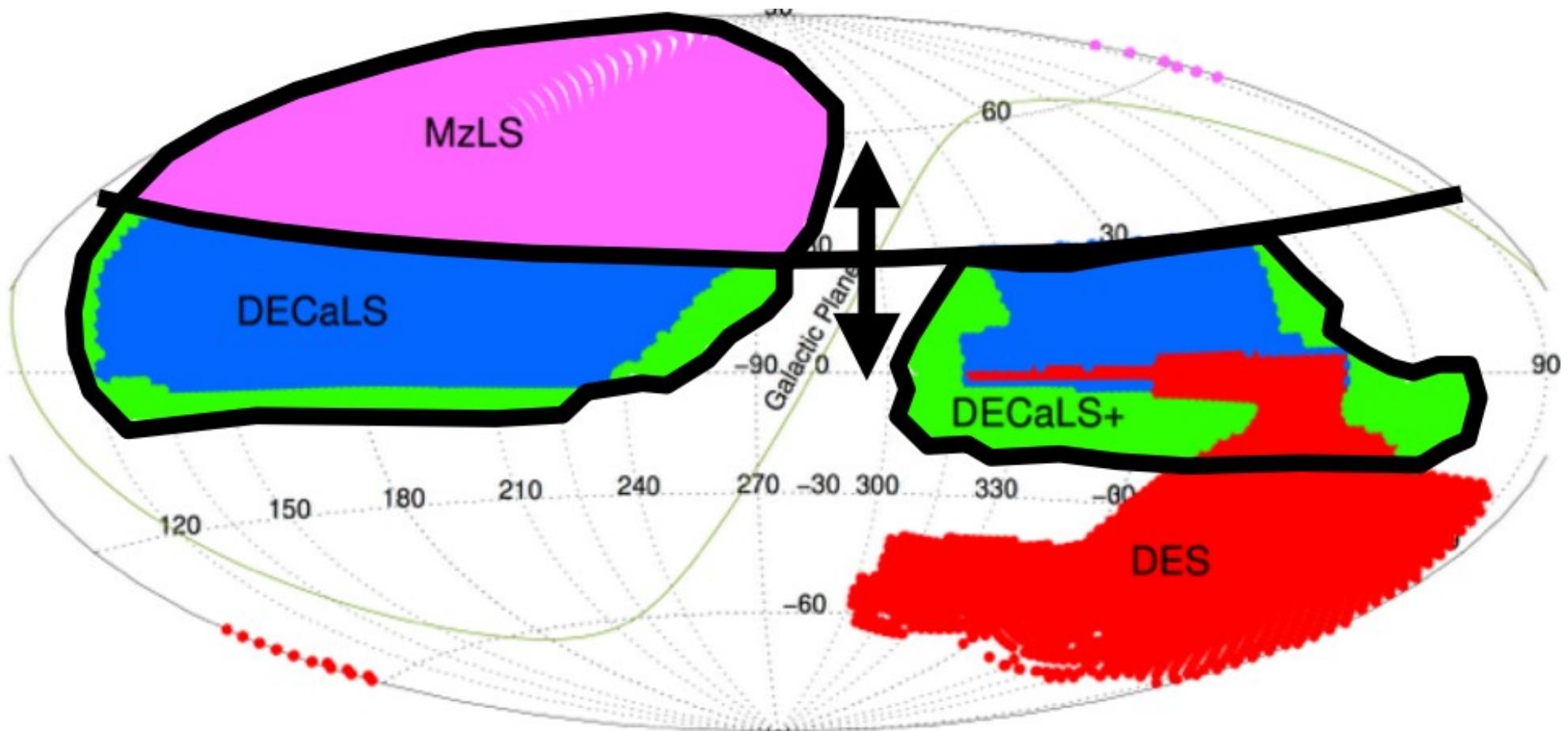
DESI

- 5000 fibers in robotic actuators
- 10 fiber cable bundles
- 3.2 deg. field of view optics
- 10 spectrographs

Readout
& Control



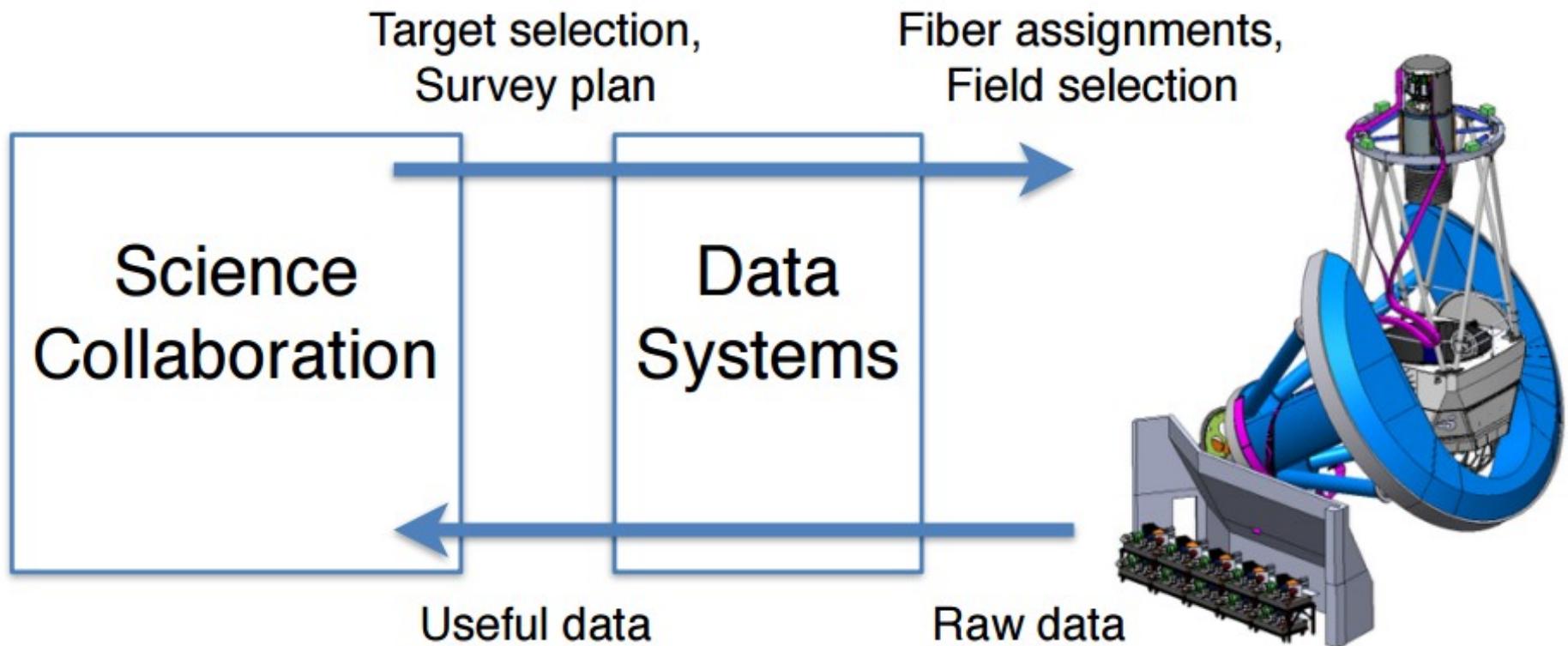
DESI medirá galaxias sobre 1/3 del cielo



En Uniandes hacemos parte de la colaboración DESI

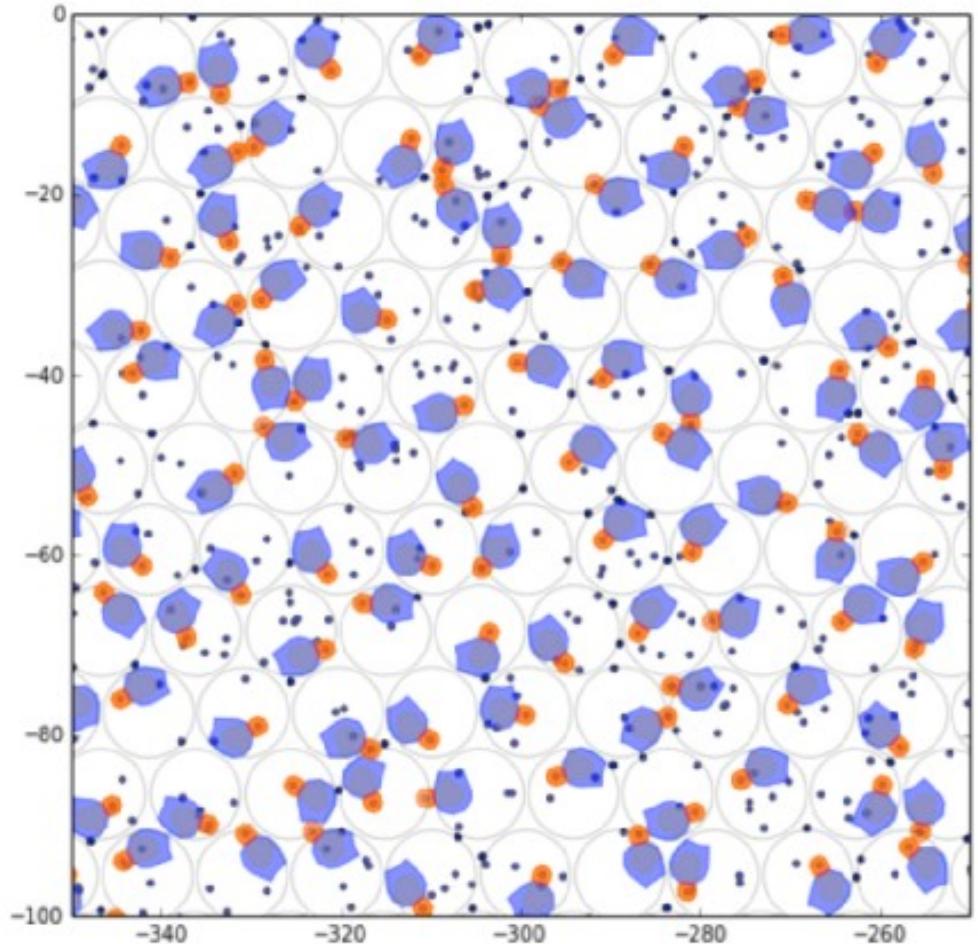
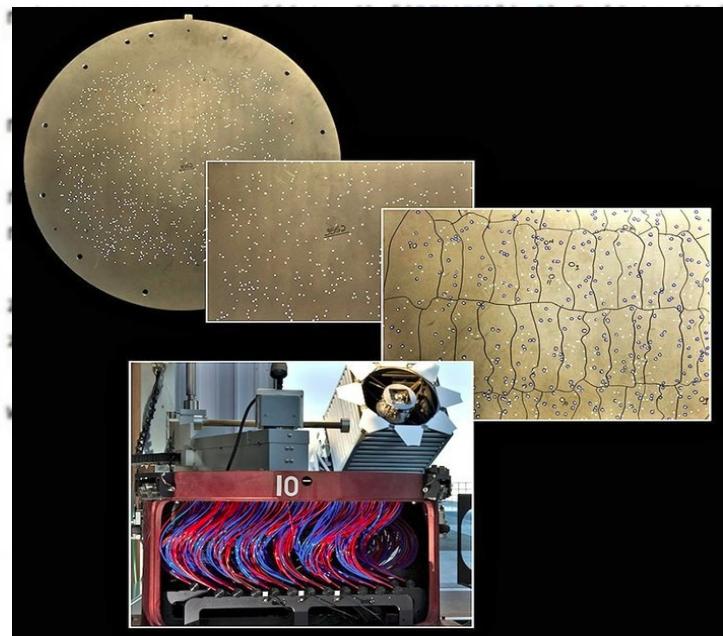


En Uniandes hacemos parte de la colaboración



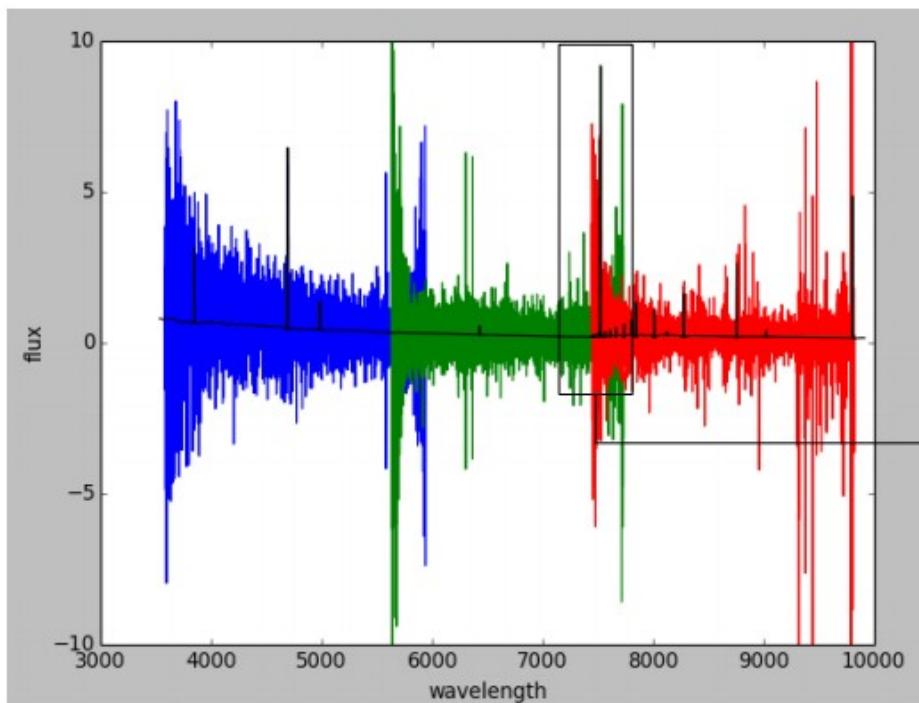
Ayudamos a simular cómo se deben mover las fibras

```
30     #LRG
31     cur.execute("select candidate.id, candidate.ra, candidate.dec, decam.g,
32
33     m=cur.fetchall()
34     data = np.array(m)
35
36     data_dic = dict([('ID', data[:,0]), ('RA', data[:,1]), ('DEC', data[:,2]),
37                     ('GFLUX', data[:,3]), ('RFLUX', data[:,4]), ('ZFLUX',
38                     ('GFRAC', data[:,7]), ('RFRAC',data[:,8]), ('ZFRAC', i
39
40
41     & ('ZFLUX')!=0) &
42     & ('RFRAC')!=0) &
43     & ('WFRAC')!=0))]
```



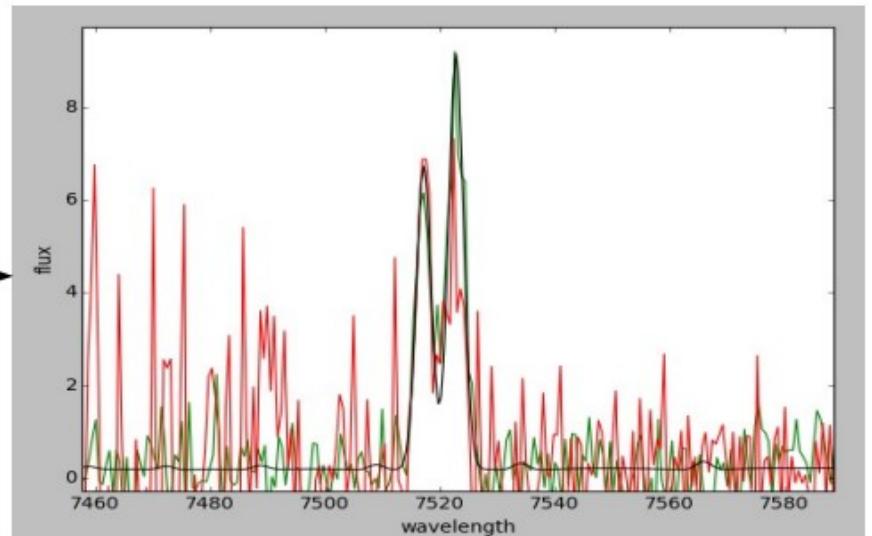
Ayudamos a simular cómo se deben analizar los espectros

Example : ELG at z=1.017 (DESI sim)



(figure from DC2)

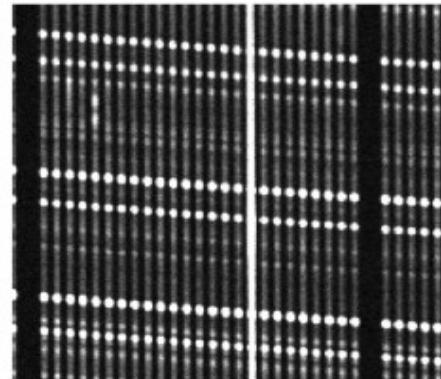
Significant [OII] doublet detection



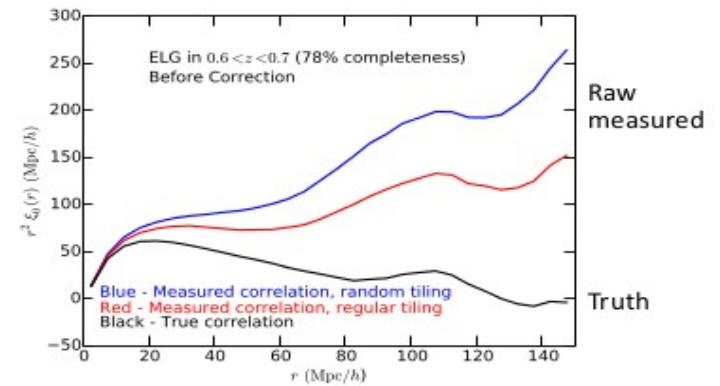
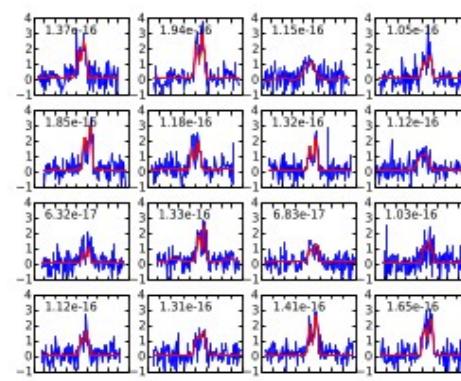
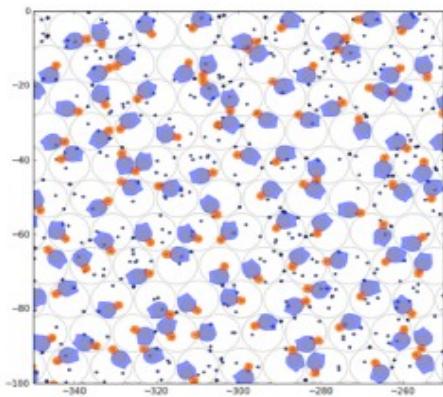
Ayudamos a simular todo el experimento



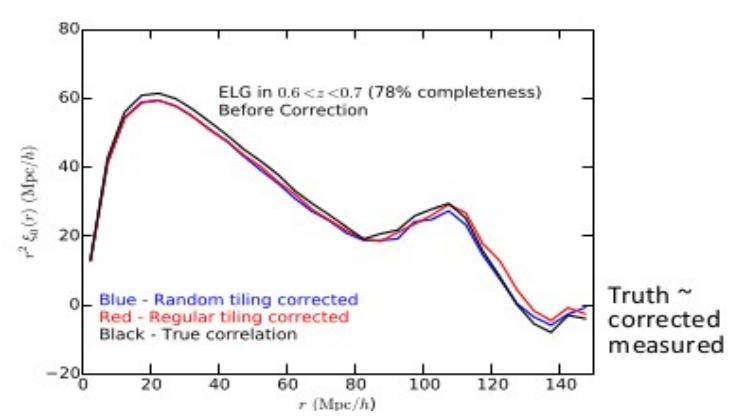
↓
Images
Targets
Fiber Assignments



↓
DESI Sims
Spectra
Redshifts



↓
Tracking Efficiencies
Large Scale Structure



Un mapa para medir la historia de expansión del Universo

