

# Large Galaxies in *Legacy Surveys* Imaging

## dr6-gallery.mp4

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Target Selection Working Group telecon  
2019 January 30

# Why care about large\* galaxies?

- Poor segmentation & model fitting severely compromises nearby faint DESI targets.
- Treated properly, we won't have to mask.
- Bona fide BGS targets, depending on (surface) brightness.
- ~One arcminute-sized galaxy per DESI pointing; gotta put fibers somewhere!
- Tons of interesting science; enormous legacy value.

\*“Large” currently defined as  $D(25) > 20$  arcsec.

DR6/7 pipeline examples (data, model, residual, left to right)—



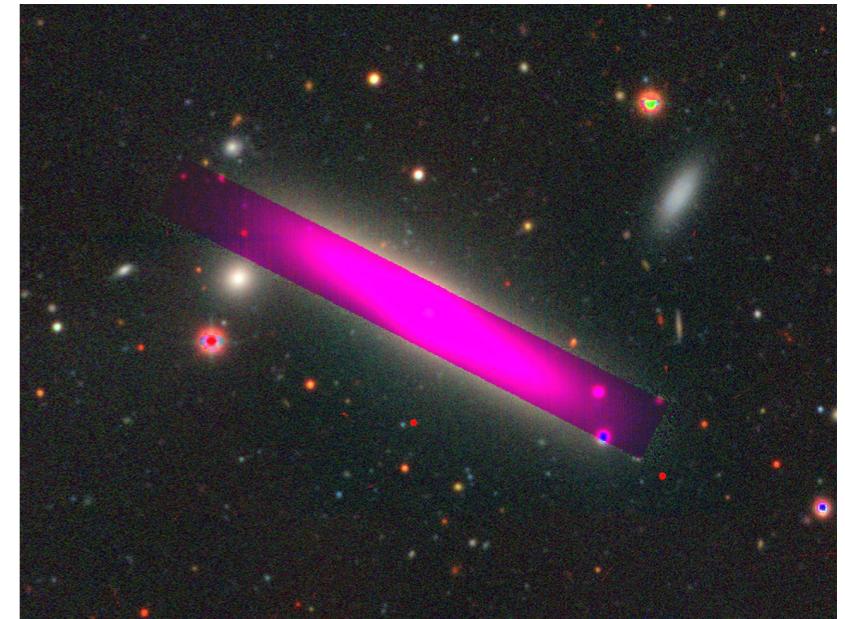
NGC5614 ( $D_{25}=2.4$  arcmin)



NGC6012 ( $D_{25}=1.8$  arcmin)

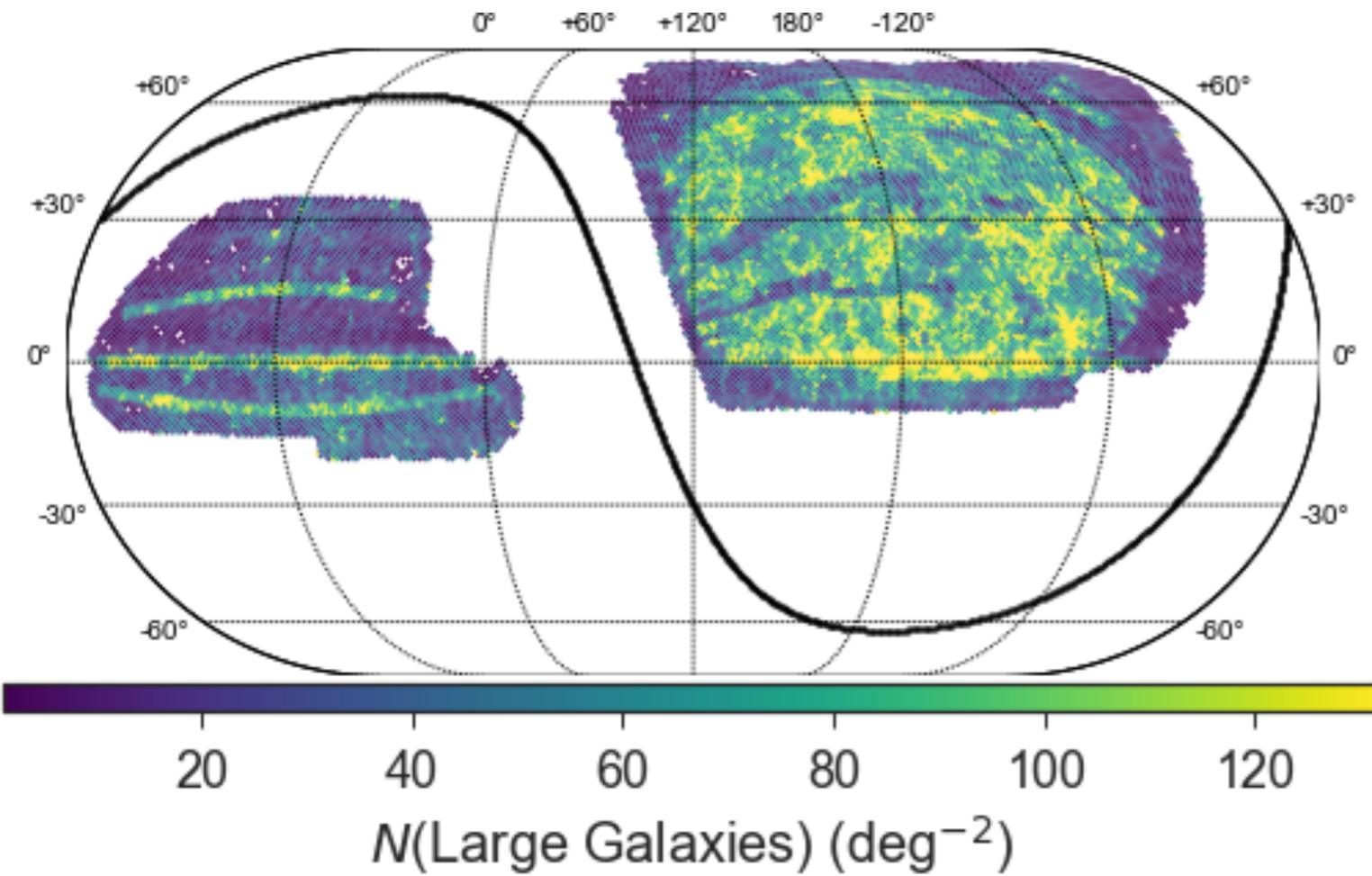
# Strategies for DR8 (in progress)—

- Improved CP processing of large galaxies (many masked as “streaks”).
- “Seed” *legacypipe* with the position and geometry of known large galaxies (**Legacy Surveys Large Galaxy Catalog**).
- Fit the large galaxy first, then Gaia point sources, then additional detected sources (+pedestal/planar sky).
- Sources in the “large-galaxy footprint” get a dedicated (GALAXY) bit in the BRIGHTBLOB catalog entry.



# Legacy Surveys Large Galaxy Catalog (LSLGA)

Moustakas, Lang et al., in prep.

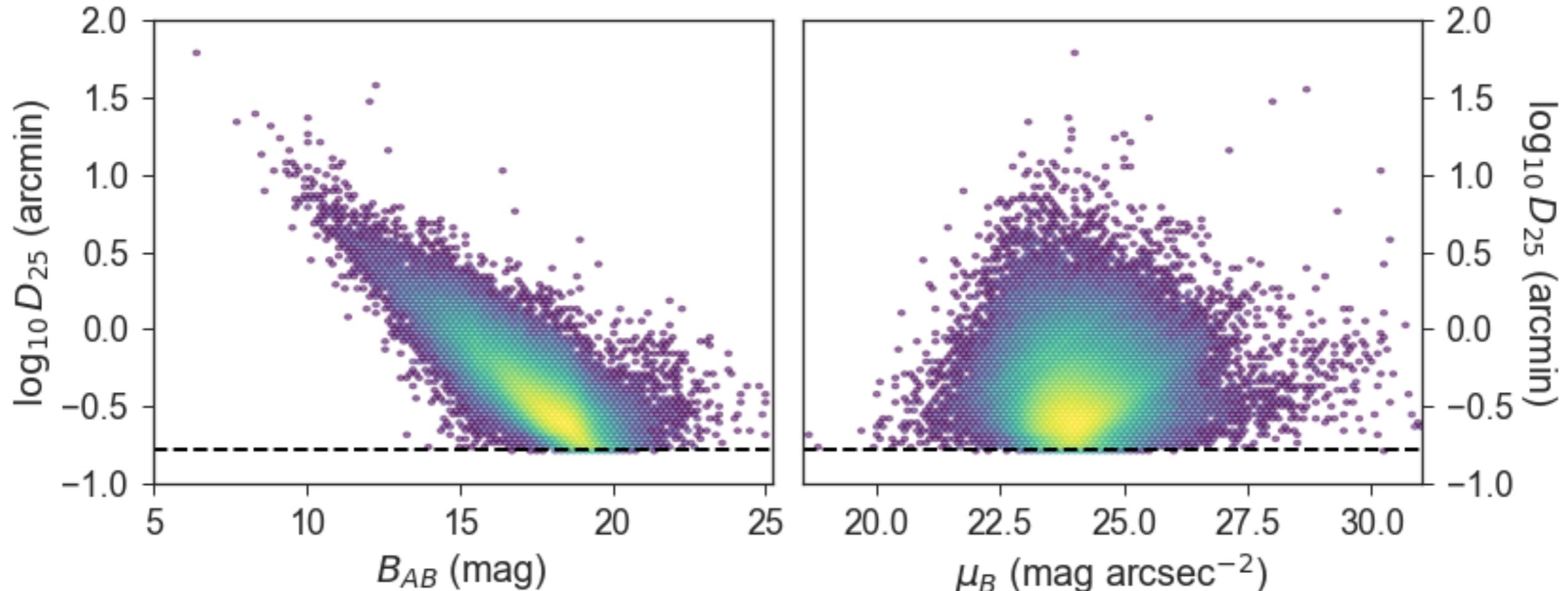


Roughly 250k known galaxies with  $D(25) > 20$  arcsec.

<https://github.com/moustakas/LSLGA>  
[/global/project/projectdirs/cosmo/staging/largegalaxies/v2.0](https://github.com/moustakas/LSLGA/tree/main/global/project/projectdirs/cosmo/staging/largegalaxies/v2.0)

# Legacy Surveys Large Galaxy Catalog (LSLGA)

Moustakas, Lang et al., in prep.



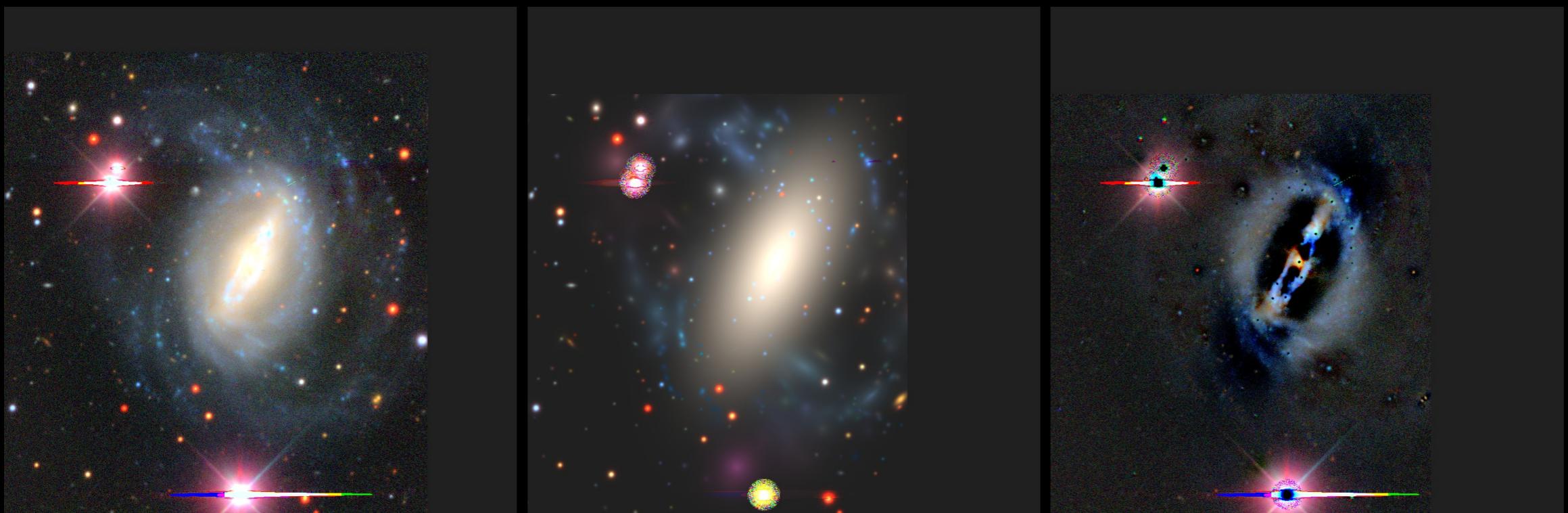
Roughly 250k known galaxies with  $D(25) > 20$  arcsec.

<https://github.com/moustakas/LSLGA>  
/global/project/projectdirs/cosmo/staging/largegalaxies/v2.0

# DR8-test005 pipeline—



NGC5614 ( $D_{25}=2.4$  arcmin)



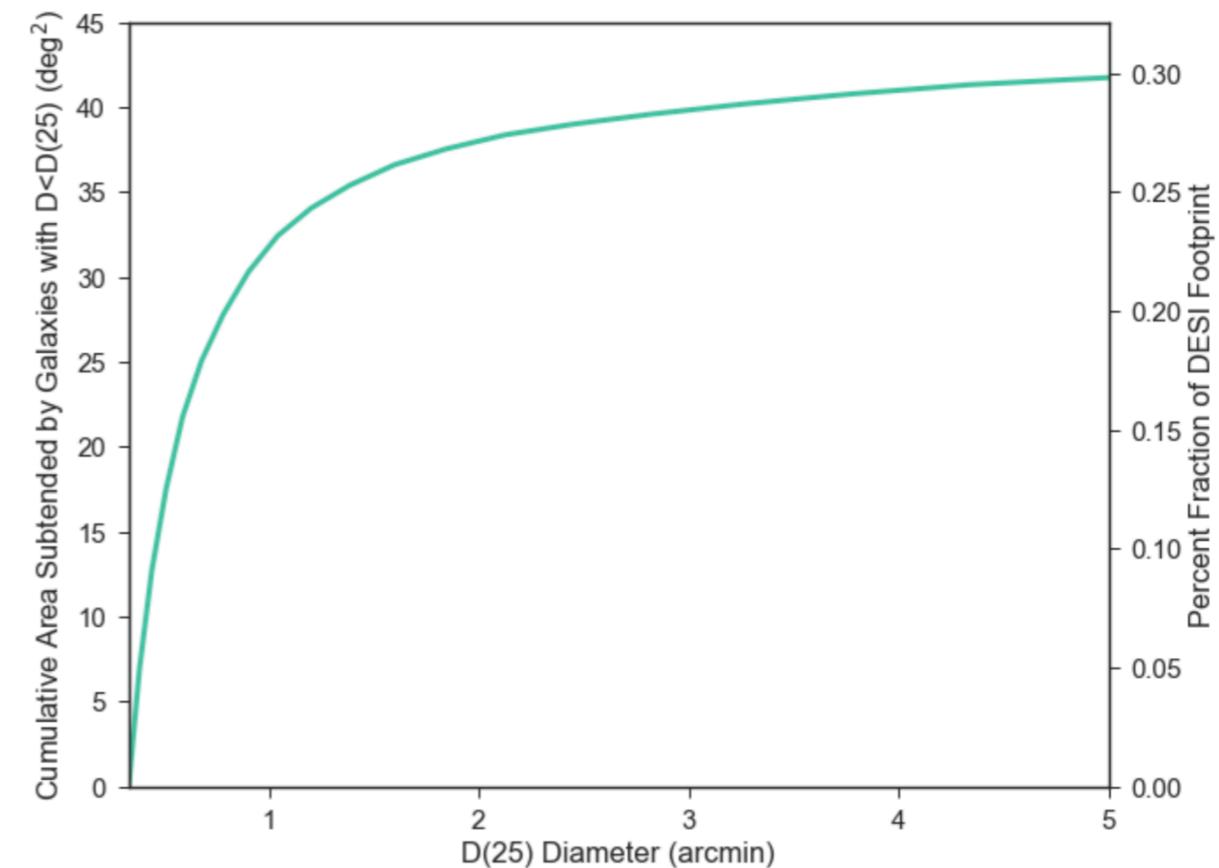
NGC6012 ( $D_{25}=1.8$  arcmin)

# Conclusions

- Improvements in the CP pipeline—
  - ▶ Less aggressive streak-finding algorithm.
  - ▶ No interpolation of masked pixels.
  - ▶ However, only a very small fraction of DECaLS imaging has been reprocessed (and no MzLS/BASS) imaging.
- Several new hooks in *legacypipe* specifically for large galaxies—
  - ▶ Seeded positions and sizes based on LSLGA/v2.0.
  - ▶ More flexible model fitting & sky-subtraction of sources within the large-galaxy footprint.
  - ▶ Preliminary results aren't perfect, but much better than before!

# Planned post-DR8, pre-DR9/DR10 work.

- Crowd-sourced visual inspection of DR8 fitting to identify common failure modes.
- Uniform CP-reprocessing of input imaging data.
- Study impact of large galaxies on DESI targeting & assess the need for masking.
- Improved sky-subtraction & galaxy modeling (e.g., Sersic fits?)
- Use the imaging data themselves to measure the centroids and moments of large galaxies (i.e., assess LSLGA incompleteness).
- Develop secondary target program(s).



<https://desi.lbl.gov/trac/wiki/DecamLegacy/Meetings/Workshop6>