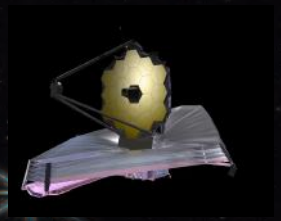

An Early Look at the Evolution of Galaxy Structure at z=3-9 with JWST

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Rochester Institute of Technology

+ the CEERS Team

2022 January 10

AAS 241 Press Conference – Seattle, WA

Evolution of Galaxies

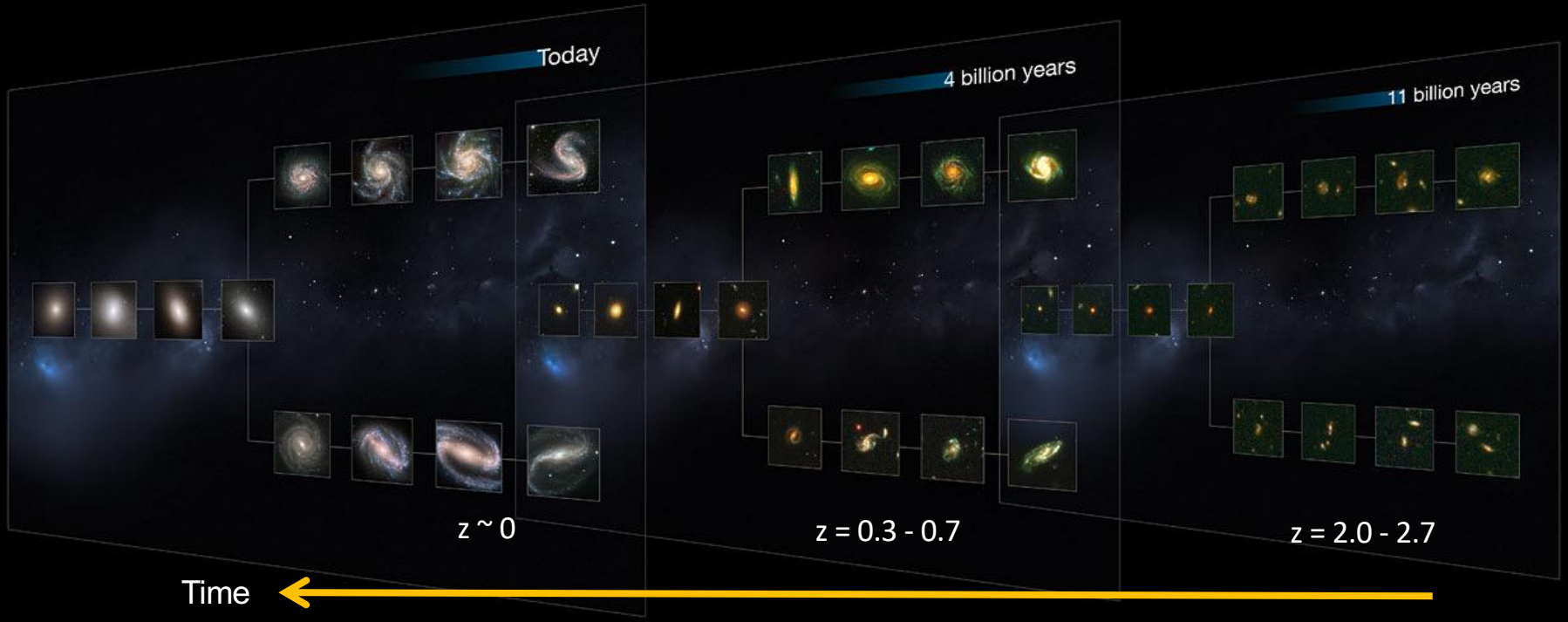


Image Credit: ESA Press Release on Lee et al. 2013

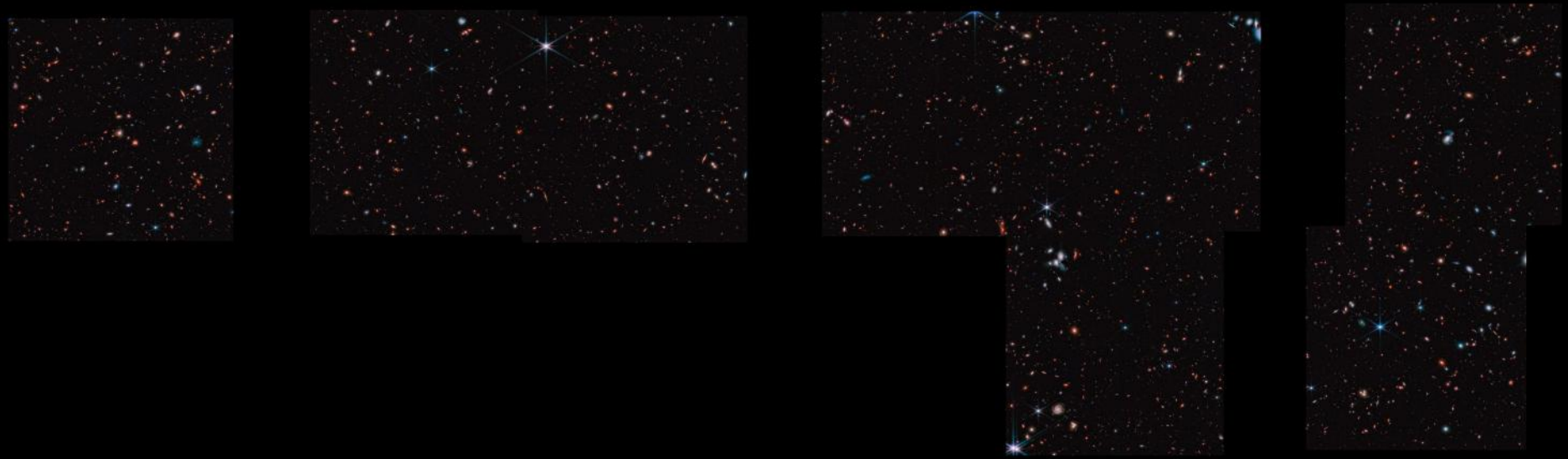
Evolution of Galaxies

- What were galaxies like at even earlier times?
- When did structures like spiral arms or bulges first form?
- How important were mergers between galaxies?

Simulated JWST images of distant galaxies

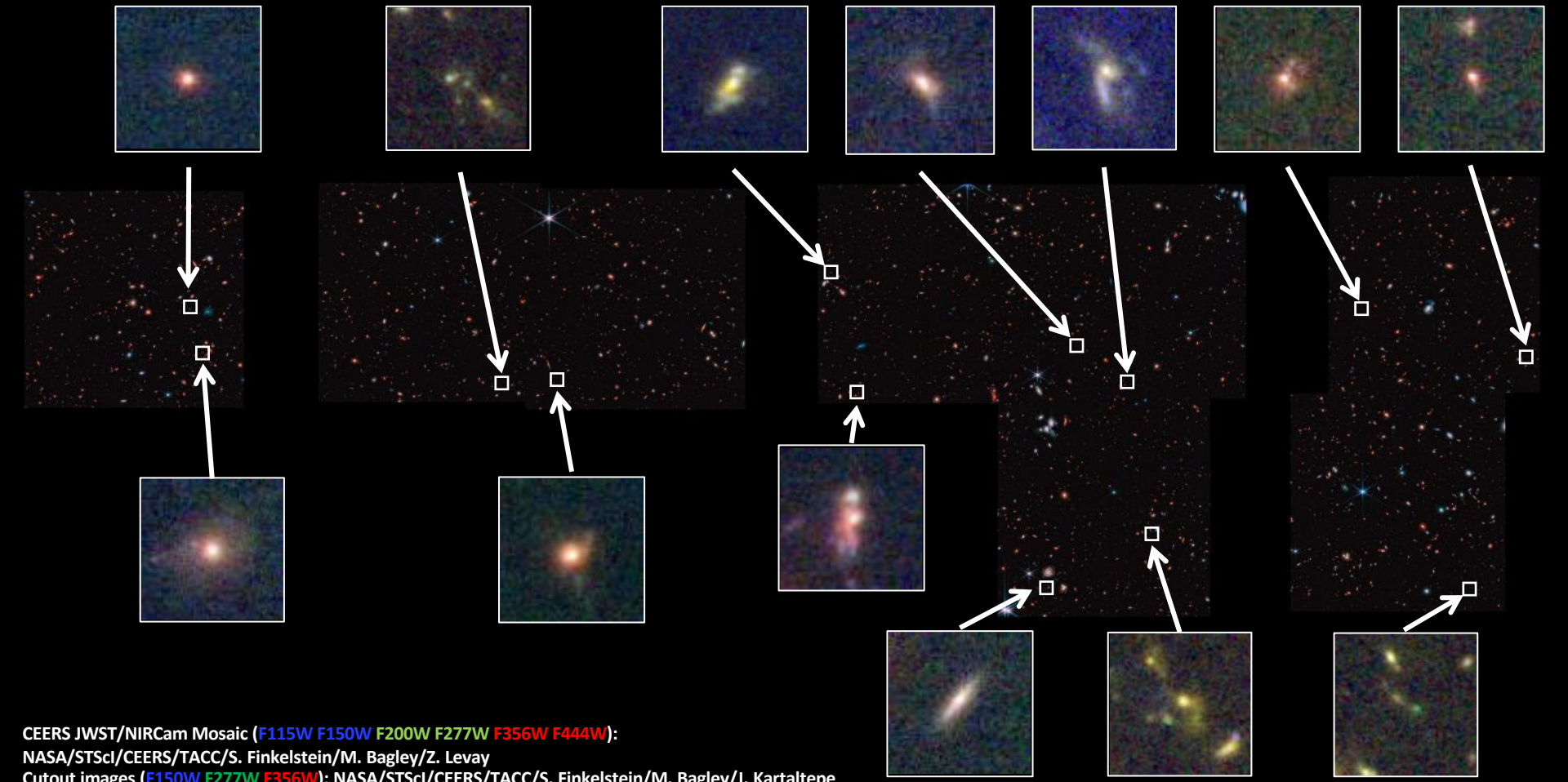
Rose, Kartaltepe et al. 2022

Cosmic Evolution Early Release Science (CEERS) Survey



CEERS JWST/NIRCam Mosaic (F115W F150W F200W F277W F356W F444W):
NASA/STScI/CEERS/TACC/S. Finkelstein/M. Bagley/Z. Levay

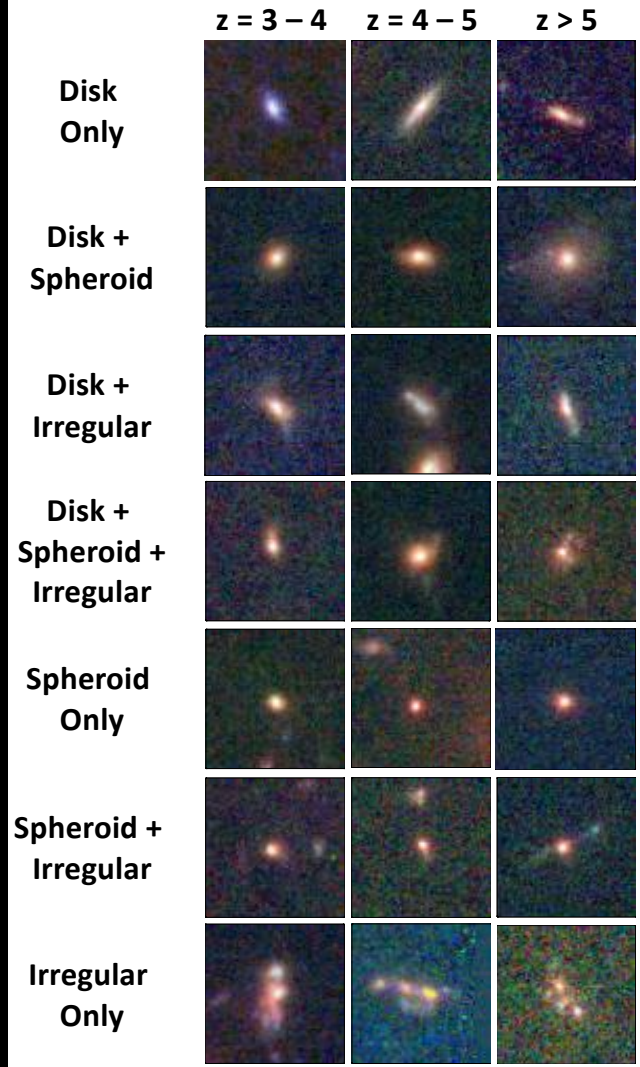
https://ceers.github.io/ceers-first-images-release.html



CEERS JWST/NIRCam Mosaic (F115W F150W F200W F277W F356W F444W):
NASA/STScI/CEERS/TACC/S. Finkelstein/M. Bagley/Z. Levay
Cutout images (F150W F277W F356W): NASA/STScI/CEERS/TACC/S. Finkelstein/M. Bagley/J. Kartaltepe

Morphology Measurements

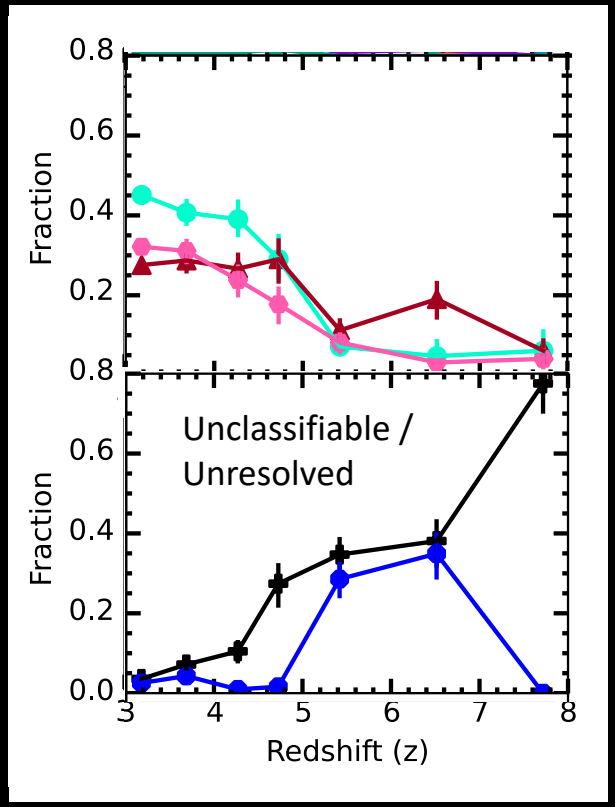
- Studied the structure of 850 galaxies at z>3 with existing HST morphologies
- Each galaxy visually classified by 3 team members
  - Does the galaxy have a disk, spheroid, or irregular features?
- Compared with several automated measures



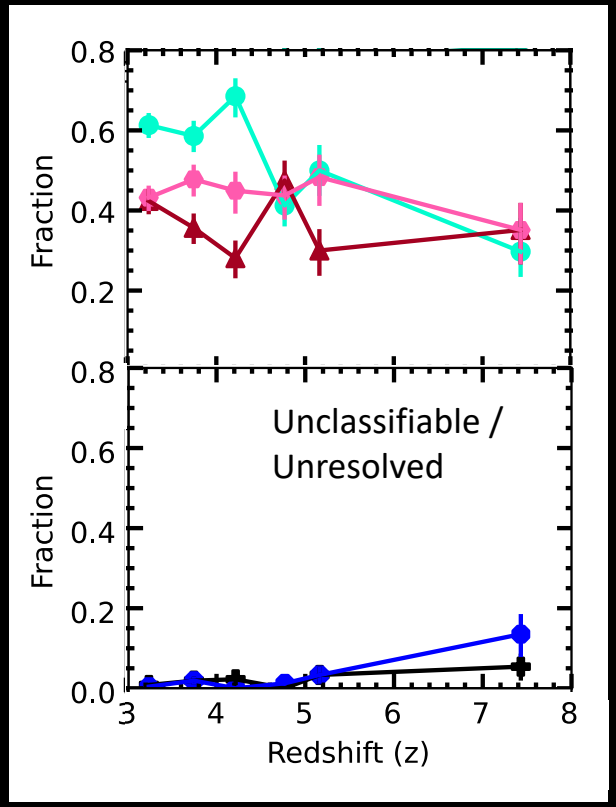
Examples of each of the 7 possible combinations of classifications

Morphological Evolution

HST CANDELS



JWST CEERS



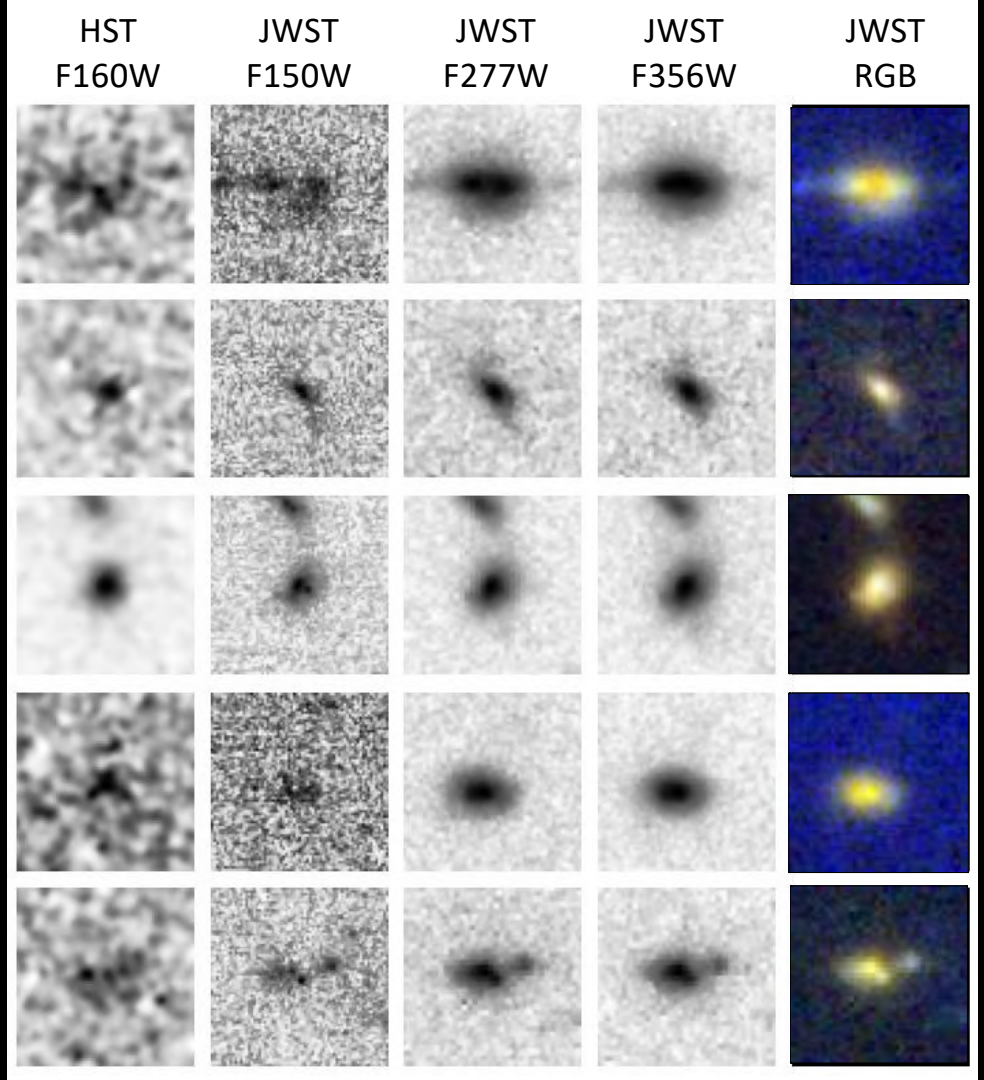
Galaxies with Disks

Galaxies with Spheroids

Galaxies with Irregular Features

Hubble vs JWST

Subset of galaxies with different morphologies between Hubble and JWST



Summary

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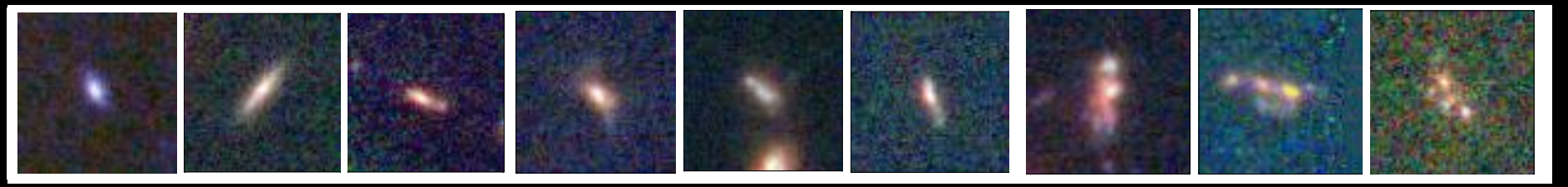
- **Wide diversity of morphologies seen at z=3-9!**
  - Large fraction of galaxies with disks (~60% → ~30%)
  - Large fraction of galaxies with irregular features (~40-50%)
- Changes seen relative to Hubble driven by
  - Depth, resolution, rest-frame wavelength
- **Large samples at even higher redshifts will enable us to quantify when the first disks and spheroids in galaxies formed**



Kartaltepe et al. 2023, in press: arXiv:2210.14713