RONGPU ZHOU & WORK ON DESI

Created by: Arjun R., Jiahui X., Sreeraaga V., Arpitha M., and Mindy W.

OUR INTERVIEWEE

Rongpu Zhou is a postdoc researcher at Berkeley Lab

BACKGROUND ON DR. ZHOU...

- He grew up in Chongqing, China and it's neighboring city, Chengdu.
- He came to the U.S. for his PhD degree from University of Pittsburgh in Pennsylvania.
  - Before graduate school, he had no experience in astronomy! He only found his passion in graduate school and made the switch.
- He loves astronomy and cosmology-- because it's not just about math and calculations, but also about observing and seeing the beauties of the sky.
- In his freetime, Rongpu enjoy hiking, cycling, swimming, tennis, badminton, reading and cooking, just to name a few.

RONGPU IN DESI

Role/Position

- postdoc at Berkeley since 2019
- worked on various aspects at DESI
  - target selection
  - survey operations
  - DESI imaging surverys
- works on the interface between observation and theory
- lot of programming (specifically python or if they want more efficient pieces of code, C)
- using detective work to figure out what is causing issues in data and sometimes publishing work into papers.

Most interesting thing about his job

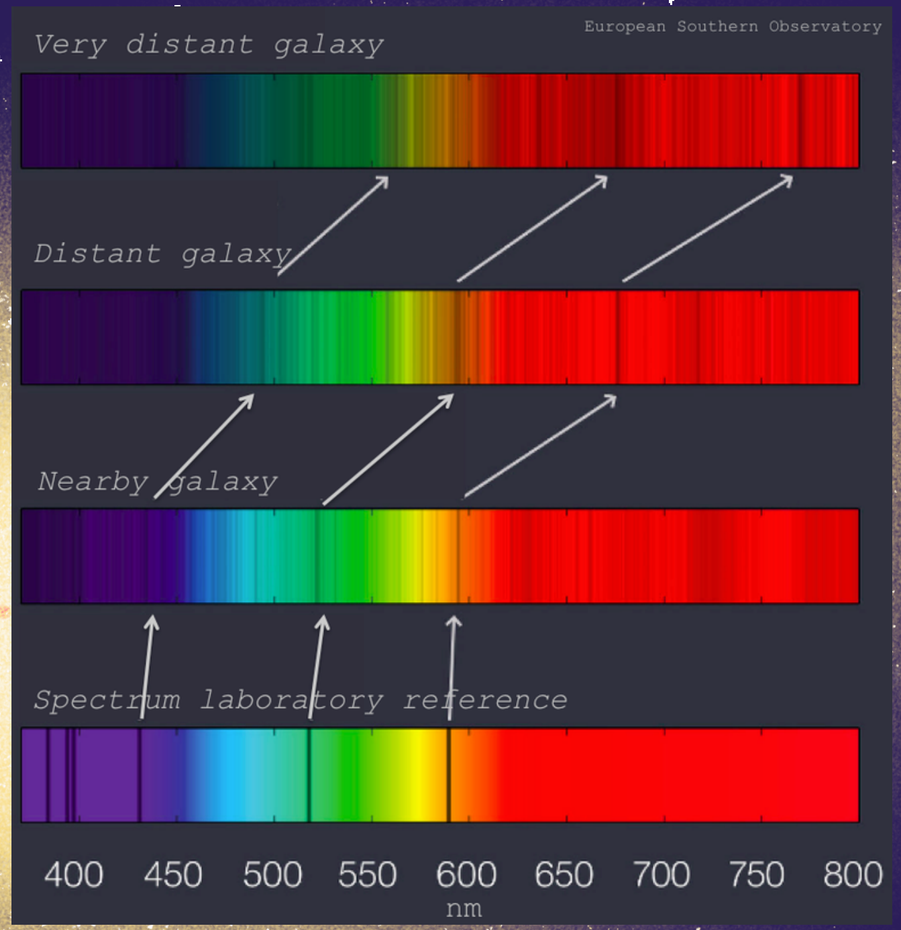
- examining data quality by scrolling over images
  - always been fascinated by how vast and beautiful the universe is.
- amazed that by mapping out tiny blobs of light in the night sky, we are learning the fundamentals of our universe.
- finds this gratifying and rewarding
- enjoys solving problems and likes collaborating with his coworkers on this project

What is DESI?

The Dark Energy Spectroscopic Instrument (DESI) is a tool cosmologists have been using to create a 3D map of the universe and track its accelerating expansion. DESI has been running for 2.5/5 years and features 5000 "eyes," each about the size of a pencil, working in tandem to image distant galaxies using their redshifting.

Photos Taken from Berkeley Lab

REDSHIFTING



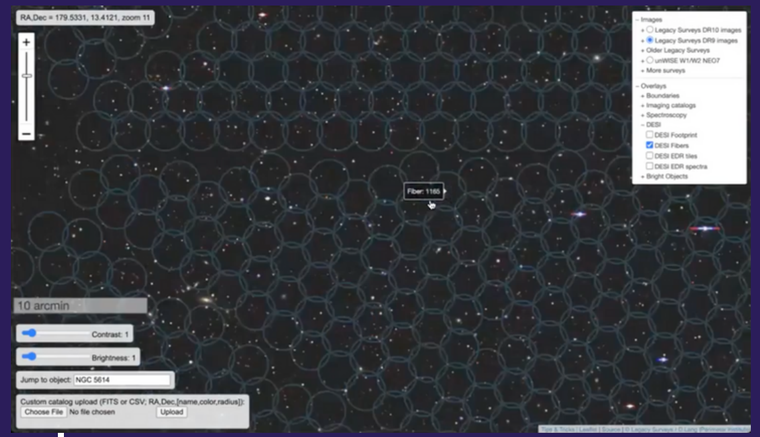
- Phenomenon where light from distant objects appears shifted toward longer wavelengths
  - Result of Doppler effect
    - Occurs due to relative motion between source and observer
  - Spectra becomes more "red"
- Quantified by parameter "z"
  - Higher values indicate higher redshift
- Two types
  - Cosmological redshift (expansion)
  - Gravitational redshift (gravity's effect).
- Opposite is blueshifting
  - Light appears shifted towards shorter wavelengths

HOW DESI WORKS

1

Legacy Survey & DESI Targets

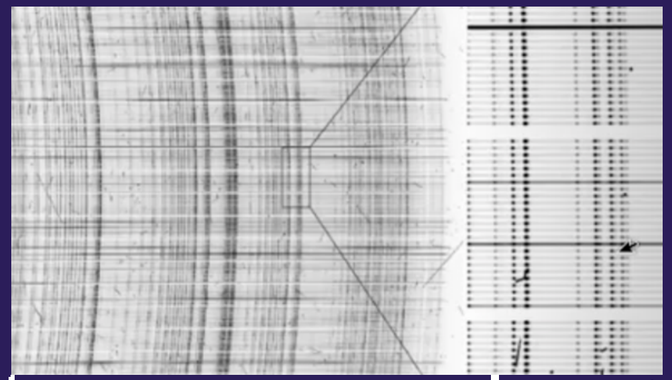
- Other telescopes image sky to give idea of what DESI looks at
  - Legacy survey
- DESI is only surveying galaxies in general, not targeting specific ones



2

Obtaining Galaxy Spectra

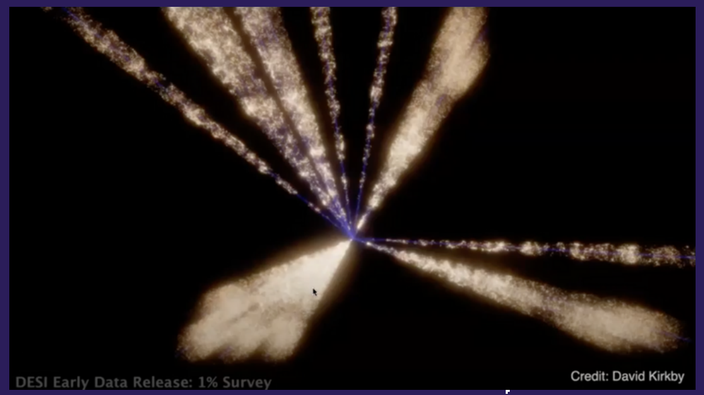
- 5000 robotic sensors move individually to aim at different galaxies within region of space DESI faces
- Robotic sensors carry fibers that capture all wavelengths of light from distant galaxies
  - Information is recorded in a 2D array detailing the optical spectra of each galaxy



3

Analyzing Data & Creating 3D Map

- Scientists use spectral redshift of the galaxies to measure distance and velocity
- 3D map of galaxies can be created
  - Helps development of dark energy theories
- Data also enables scientists to understand relationships between galaxies themselves



MORE ABOUT DESI

What is the purpose of DESI?

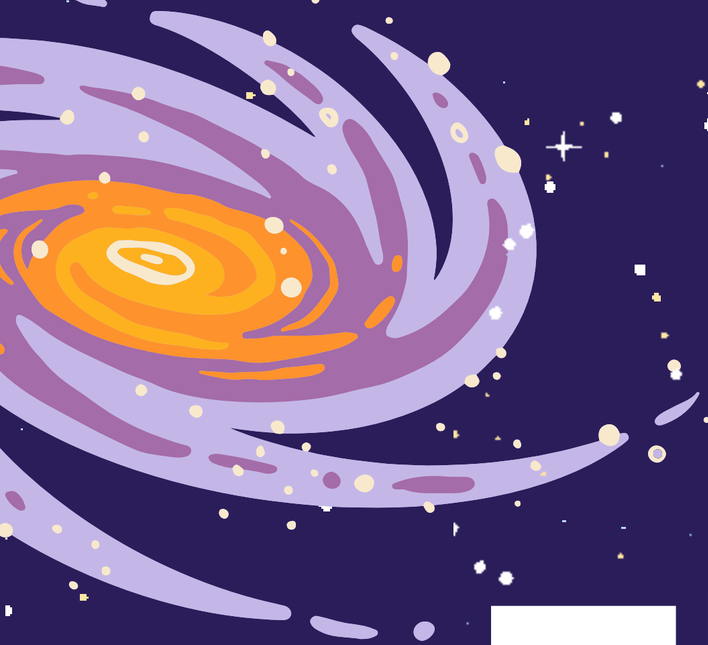
DESI aims to create the largest 3D map of the universe and accurately measure the rate of which the universe expands. It's similar to the CMB background picture from the Planck satellite, except that it's mapping a time period that comes much later, specifically the evolution of galaxies.

Challenges

- contamination and having to change the model
- galaxies become fainter when closer to the limit of instrument
- creates a lot of noise

Physicists at DESI are working on:

- currently cleaning up the measurements made of the galaxies
- solutions for the contamination
- problems with optical technology



Any Questions?

Thank you!