Exotic Galaxies Tour - Teacher Guide

The Exotic Galaxies tour features less well-known types of galaxies. This teacher guide is designed to provide ways for you to actively engage your students in exploring the First Look Rubin's Cosmic Treasure Chest image. The guide assumes that you as the instructor are moving through the tour stops (images) and using the material below to engage students in conversation and to elicit questions. Optionally, you may choose to go through the tour without discussing the *Do You Wonder?* questions.

The tour makes use of 2-3 different text boxes for each tour stop. "Did You Know?" text boxes will highlight an interesting fact related to the type of object. "Do You Wonder?" text boxes will pose a question with no displayed answer. Additional information for each of the "Do You Wonder?" questions are provided below.

Takeaway
Most objects in this image are galaxies.

Notes

- Stars usually appear as bright spots with (diffraction) spikes pointing outward. These spikes are the result of starlight bending around the telescope's internal support structures. Spikes are not a real feature of a star.
- Most nearby galaxies appear larger and may show structure and features. The colors of nearby galaxies may be used to determine the relative rate of star formation: Galaxies that are bluer are actively forming stars, while galaxies that appear yellow or orange have likely ceased star formation.
- For the majority of the small galaxies in the image that do not show any features/structure, the apparent color is due to redshifted light and may be used to determine distance (redder is farther).

Click here to go to the Exotic Galaxies Tour

Tour Stop and Title	Do You Wonder?
1 Galaxy with tidal tail	Do you wonder how large a tidal tail can be? *Some tidal tails can stretch over one million light years in length.*
2 Low surface brightness galaxy	Do you wonder what causes low surface brightness galaxies to appear so dim? *Low surface brightness galaxies are thought to have formed most of their stars early in their history. Over time, the stars that remain are smaller, redder, dimmer, and spread over a larger area than a typical galaxy.*
3 Shell galaxy	Do you wonder what could have caused the shells in this galaxy? *These shells are the result of gravitational interactions caused by a smaller galaxy passing through a larger galaxy, causing ripples of stars and gas to form shell-like structures.*
4 Compact Galaxy Group	Do you wonder if a compact galaxy group is just a smaller version of a (larger) galaxy group? *Galaxies in compact groups are on average smaller, brighter and have less active star formation inside the galaxies than in other (larger) groups. Star formation does happen in compact groups, but it is usually in tidal tails and outside the galaxies.*
5 Lenticular galaxy	Do you wonder how a galaxy with this unique set of features could have formed? *There are several theories: They may have lost their arms due to mergers or tidal interactions with other galaxies, or they have exhausted their ability to form new stars because they have little gas remaining.*
6 Ring galaxy	Do you wonder what could have caused this galaxy to have a ring shape? *A ring galaxy forms when a smaller galaxy passes through the center of a larger one, causing the stars, gas, and dust to spread out into a ring shape.*

7 High redshift galaxy group	Do you wonder if the galaxies in a high redshift galaxy group are similar in age? *When astronomers observe a group of small, red galaxies that are relatively close together, they can infer that these galaxies formed at about the same time in the early Universe.*
8 Lensed galaxy	Do you wonder what objects can serve as a gravitational lens? *Astronomers have observed stars, galaxies, galaxy groups and dark matter that can create a gravitational lens.*
9 Active galaxy	Do you wonder what percent of galaxies are active galaxies? *Although most massive galaxies are thought to have supermassive black holes at the center, only 5-10% of them are active. Active galaxies have large amounts of gas spiraling into the black hole, creating a hot accretion disk (and sometimes jets) that can produce radiation at many different wavelengths across the electromagnetic spectrum, especially in radio, x-ray and gamma rays.*