

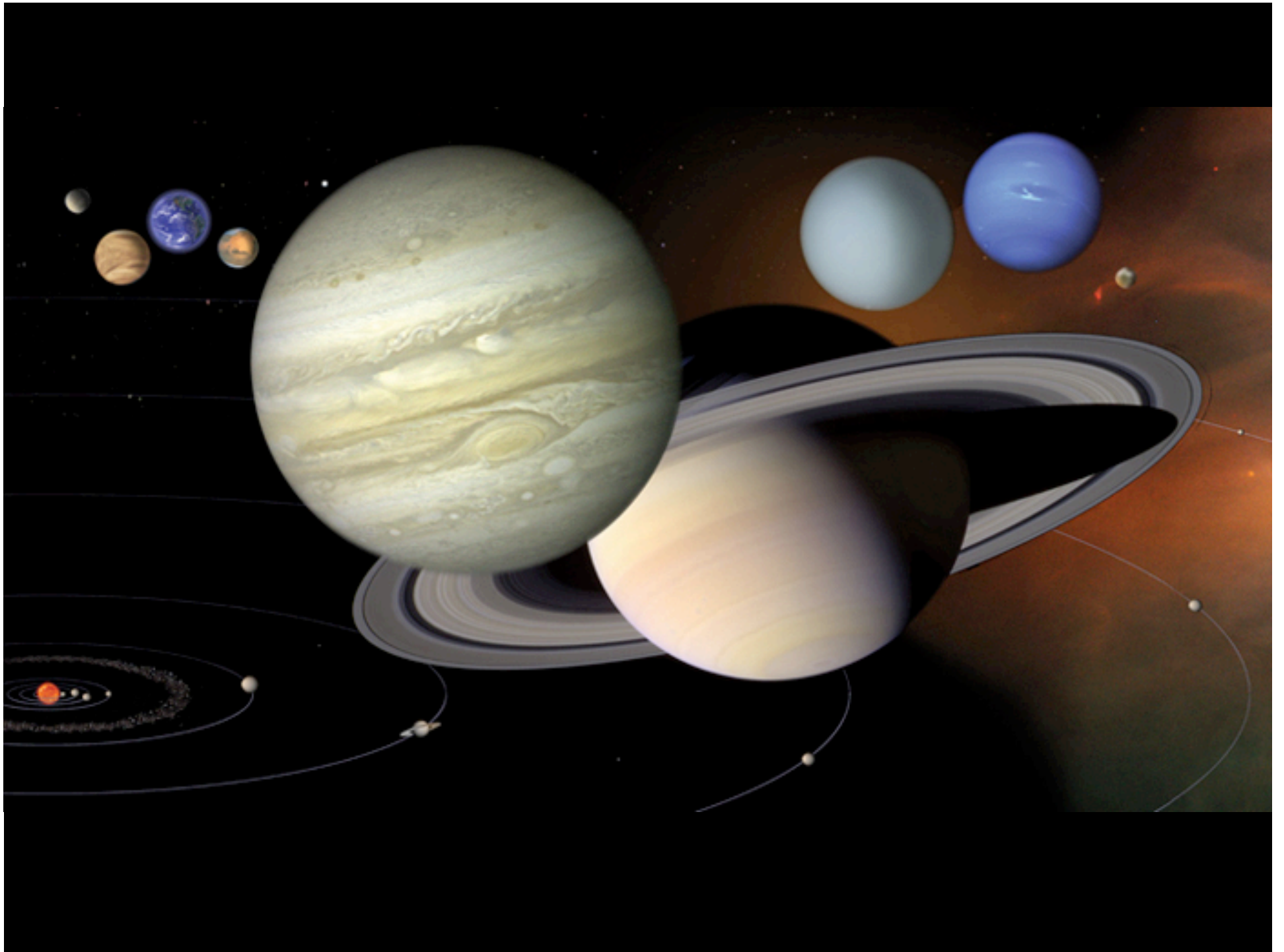


Galaxies

Jes Ford

PhD Student at UBC





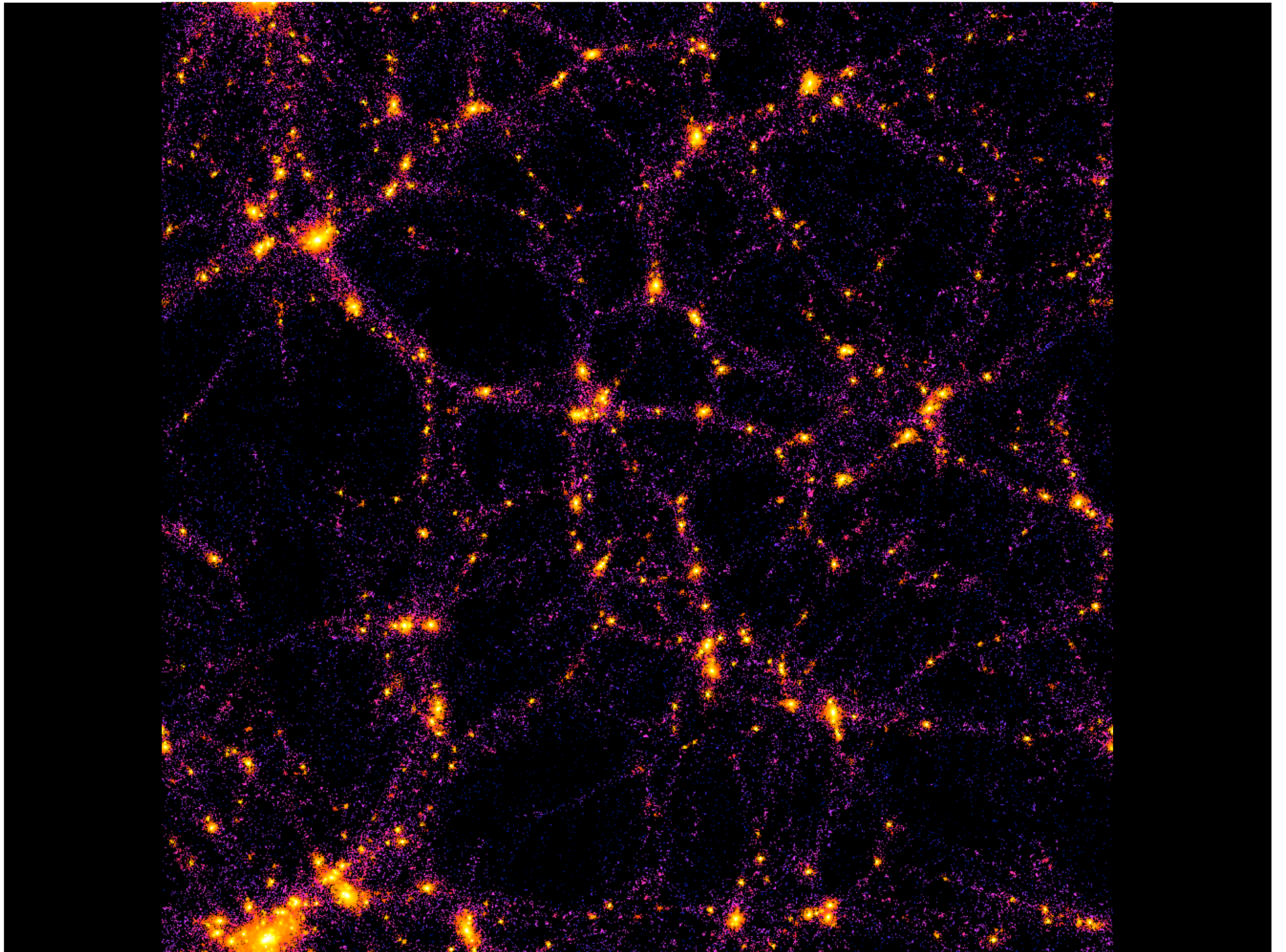


The Night Sky









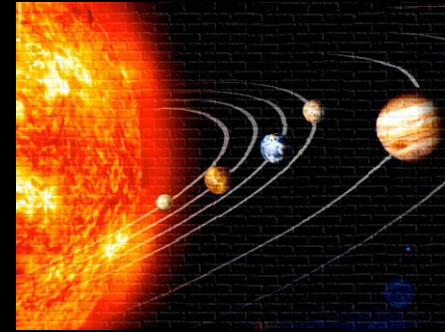
Sizes in the Universe



$\sim 1 \text{ m}$



$\sim 10^7 \text{ m}$



$\sim 10^{13} \text{ m}$

$\sim 500 \text{ light minutes}$



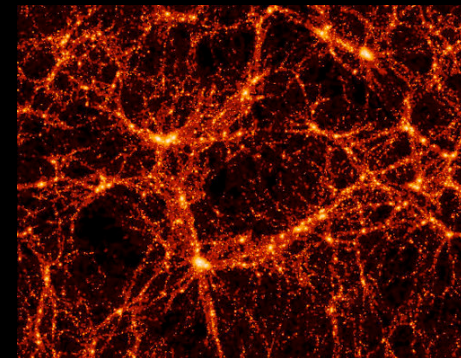
$\sim 10^{21} \text{ m}$

$\sim 100,000 \text{ light years}$



$\sim 10^{23} \text{ m}$

$\sim 10 \text{ million light years}$



$> 10^{24} \text{ m}$

$> 100 \text{ million light years}$

What makes up a Galaxy?

What makes up a Galaxy?

- **Stars**
100 Billion per galaxy, but its a small part overall
- **Gas and Dust**
More gas than stars, glows in infrared light
- **Planets, Rocks, Asteroids**
a very small part of a galaxy, dark
- **Dark Matter**
Invisible, but makes up MOST of the galaxy!



Galaxy Types



Spiral galaxies



Elliptical galaxies

Flythrough the universe

- **Sloan Digital Sky Survey (SDSS) has made a 3D map of galaxies in part of the universe.**
- **But there are more than 100-Billion galaxies in the observable universe!**
- **Way too many galaxies for astronomers to classify, and computers aren't smart enough yet... We need **CITIZEN SCIENTISTS**.**

Today's Project: **Galaxy Zoo**

[CLASSIFY](#)[SCIENCE](#)[STORY](#)[ASTRONOMERS](#)[DISCUSS](#)[PROFILE](#)

Few have witnessed what you're about to see

Experience a privileged glimpse of the distant universe, observed by the Sloan Digital Sky Survey and Hubble Space Telescope

Classify Galaxies

To understand how galaxies formed we need your help to classify them according to their shapes. If you're quick, you may even be the first person to see the galaxies you're asked to classify.

[Begin Classifying](#)

Galaxy Zoo

- www.galaxyzoo.org
- Click **CLASSIFY** to start
- Click **INVERT** to swap colours back and forth
- Click **FAVOURITE** to save a galaxy
- Click **PROFILE > FAVOURITES** to view
- Click **CLASSIFY** to go back to more galaxies
- Click **SCIENCE** if you want to learn more

SHAPE

Is the galaxy simply smooth and rounded, with no sign of a disk?



Smooth



Features or disk



Star or artifact



DISK

Could this be a disk viewed edge-on?



Yes



No



Other Citizen Scientist Projects on: The Zooniverse

ZOONIVERSE
REAL SCIENCE ONLINE

Take part in **Science Projects** Experiment in **Laboratory**

galaxyzoo.org

How do galaxies form?
View details

All Space Climate Humanities Nature Biology

Space

Sort by Category



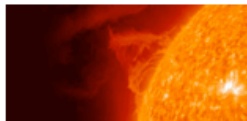
How do galaxies form?
NASA's Hubble Space Telescope archive provides hundreds of thousands of galaxy images.

GALAXY ZOO



Explore the surface of the Moon
We hope to study the lunar surface in unprecedented detail.

MOON ZOO



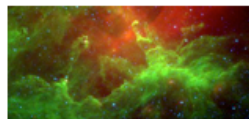
Study explosions on the Sun
Explore interactive diagrams to learn about the Sun and the spacecraft monitoring it.

SOLAR STORMWATCH



Find planets around stars
Lightcurve changes from the Kepler spacecraft can indicate transiting planets.

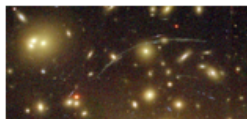
planethunters.org



How do stars form?
We're asking you to help us



Explore the Red Planet
Biology scientists need



Help us find gravitational lenses

Climate



Model Earth's climate using historic ship logs
Help scientists recover Arctic and worldwide weather observations made by US Navy and Coast Guard ships.

Weather



Classify over 30 years of tropical cyclone data.
Scientists at NOAA's National Climatic Data Center need your help.

CycloneCenter

Humanities



Study the lives of ancient Greeks
The data gathered by Ancient Lives helps scholars study the Oxyrhynchus collection.

ANCIENT LIVES

Nature



Hear Whales communicate
You can help marine researchers understand what whales are saying

WHALES



Help explore the ocean floor
The HabCam team and the Woods Hole Oceanographic Institution need your help!

SEAFLOOR EXPLORER



You're hot on the trail of bats!
Help scientists characterise bat calls recorded by citizen scientists.

BAT DETECTIVE



Go wild in the Serengeti!
We need your help to classify all the different animals caught in millions of camera trap images.

SNAPSHOT SERENGETI

Biology



Analyse real life cancer data.
You can help scientists from the world's largest cancer research institution find cures for cancer.

Cell Slider



Track genetic mysteries
We can better understand how our genes work by spotting the worms laying eggs.

WORM WATCH LAB

www.zooniverse.org

Galaxy Art

- Create your own galaxy artwork to take home.
- Use your favourite real galaxy from Galaxy Zoo or your imagination.
- What type of galaxy do you want to create?

