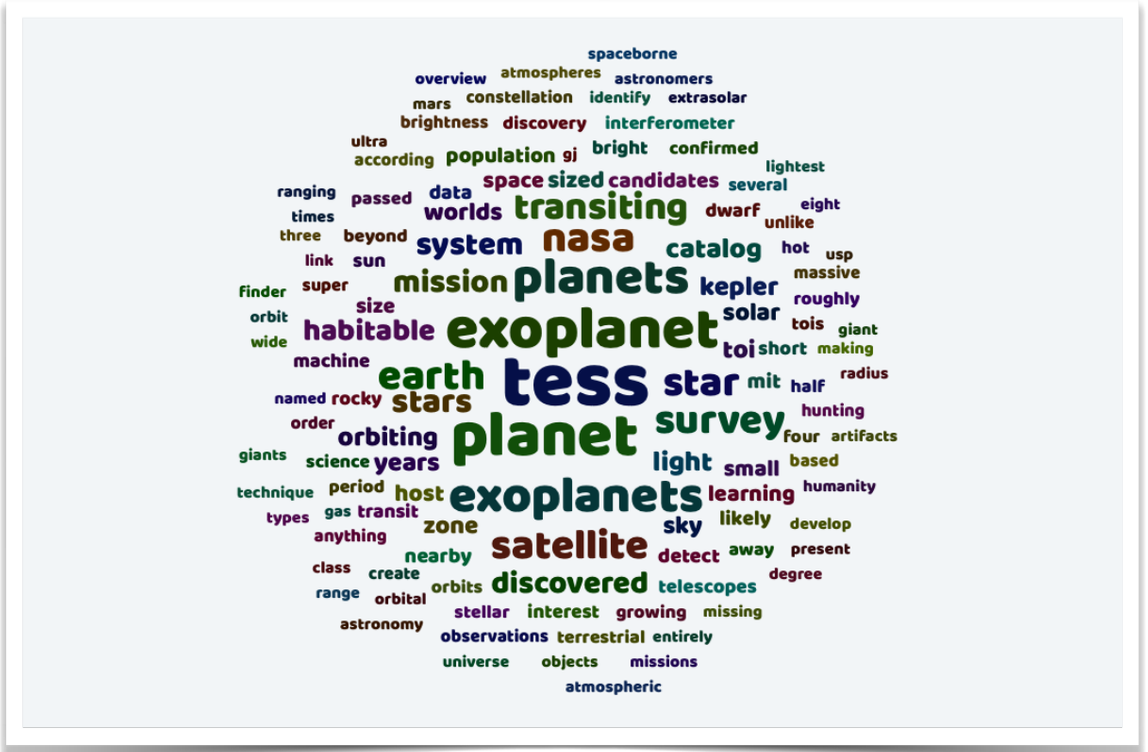
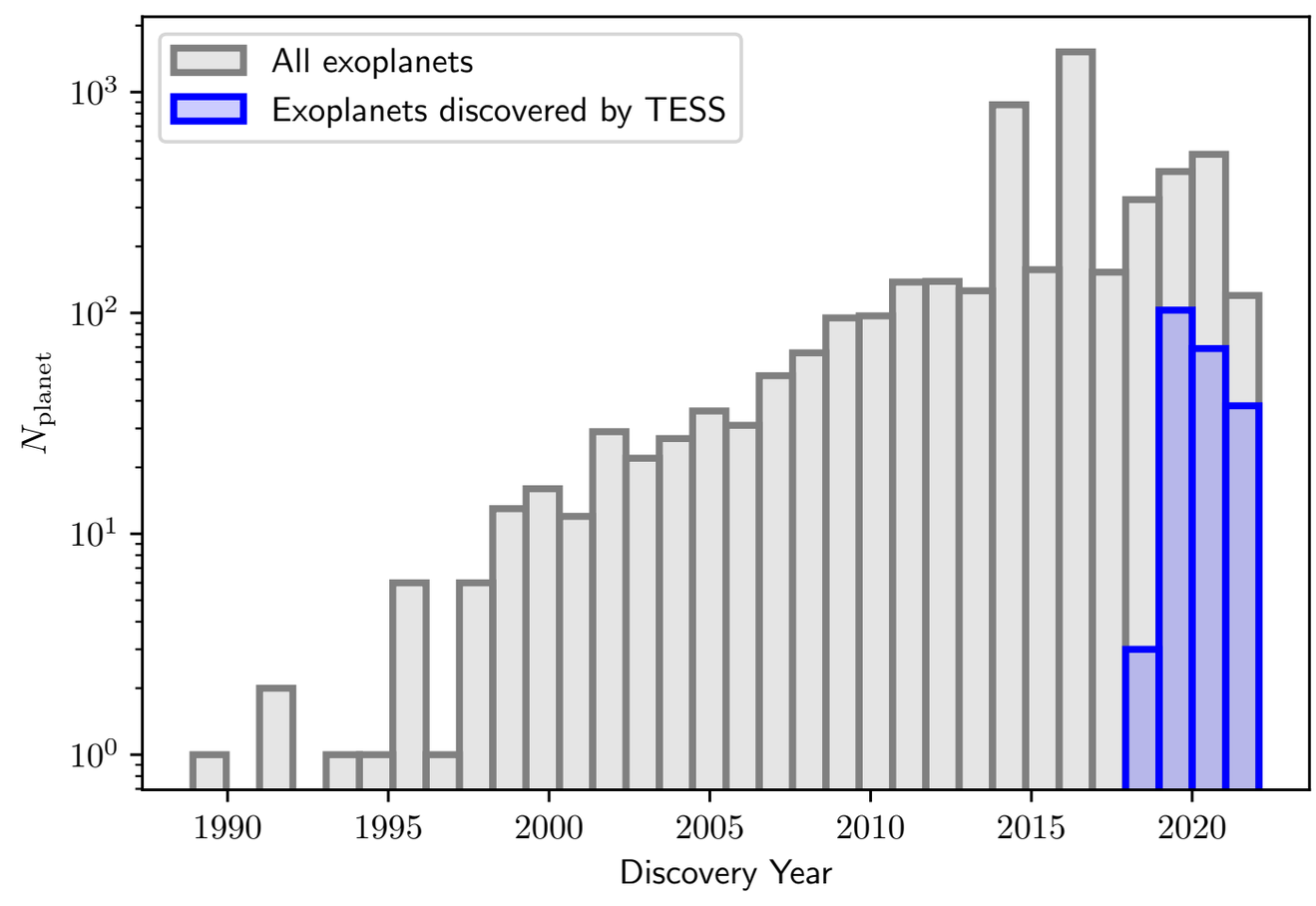
Engaging the Public in Exoplanet Science through the Legacy of TESS

Tansu Daylan, Emma Chickles, and Yadira Gaibor
June 11, 2022
AAS240 Workshop
Pasadena, CA



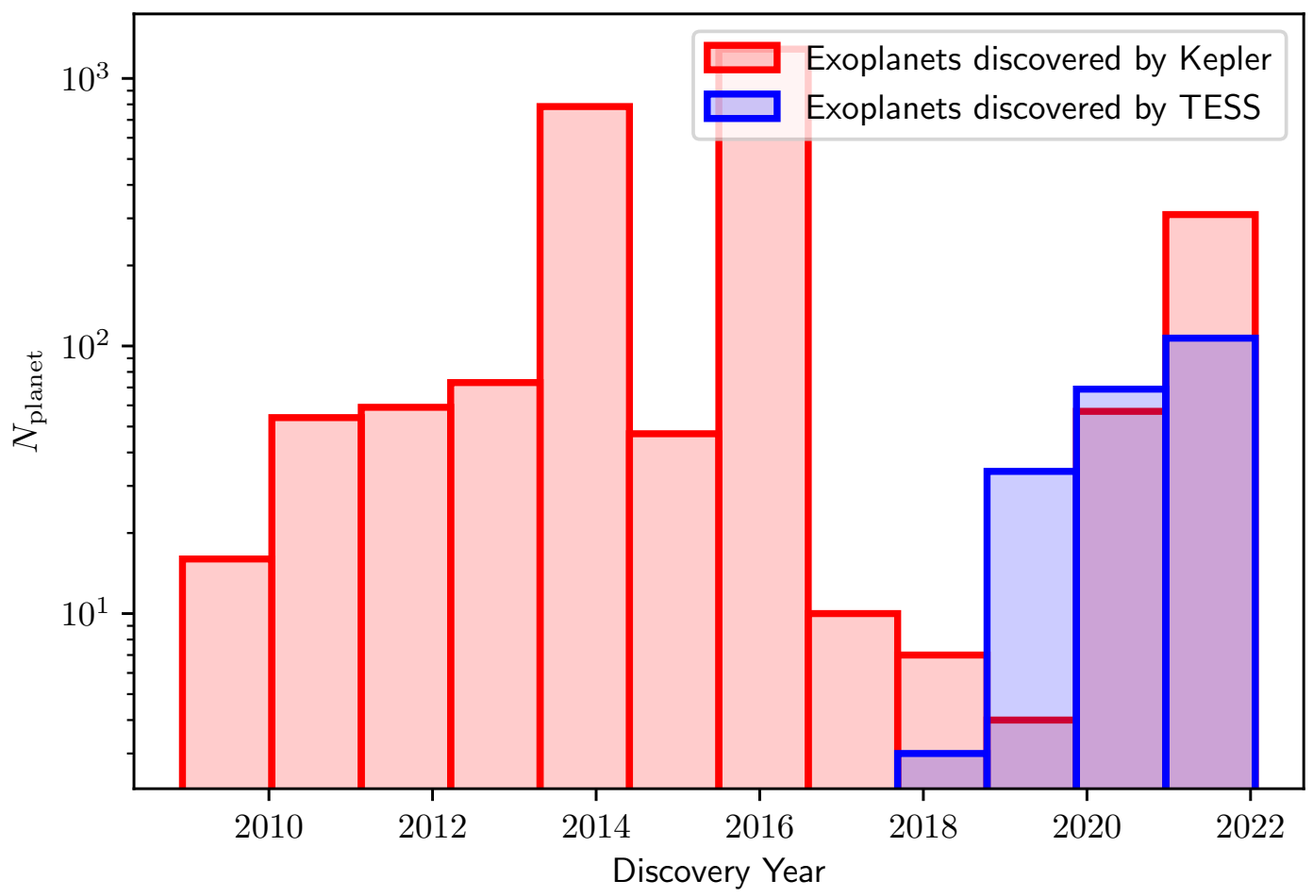
The TESS Mission

- The TESS mission has been discovering small, transiting exoplanets. Although this is a major contribution, the total yield of TESS will likely not match that of Kepler.



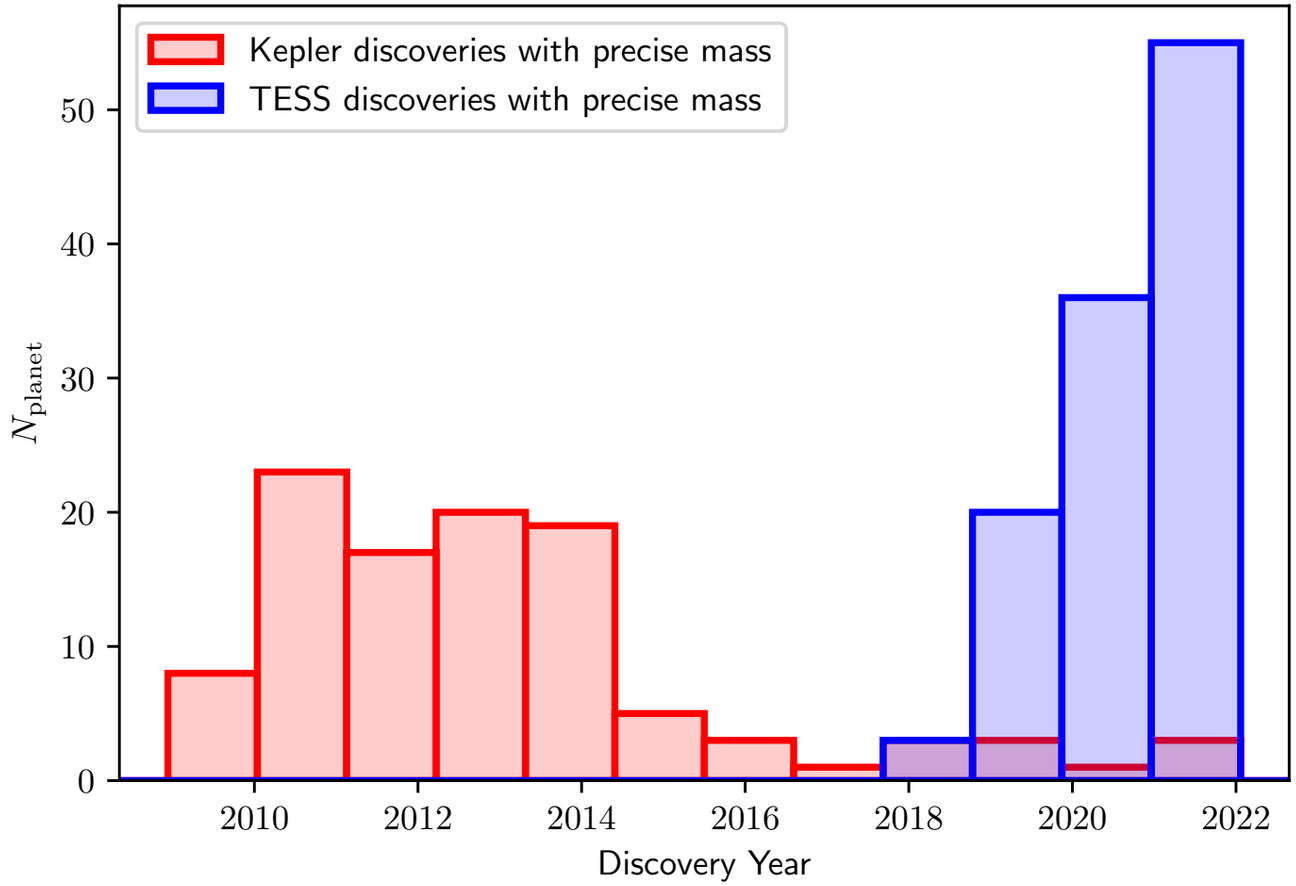
The TESS Mission

- The TESS mission has been discovering small, transiting exoplanets. Although this is a major contribution, the total yield of TESS will likely not match that of Kepler.



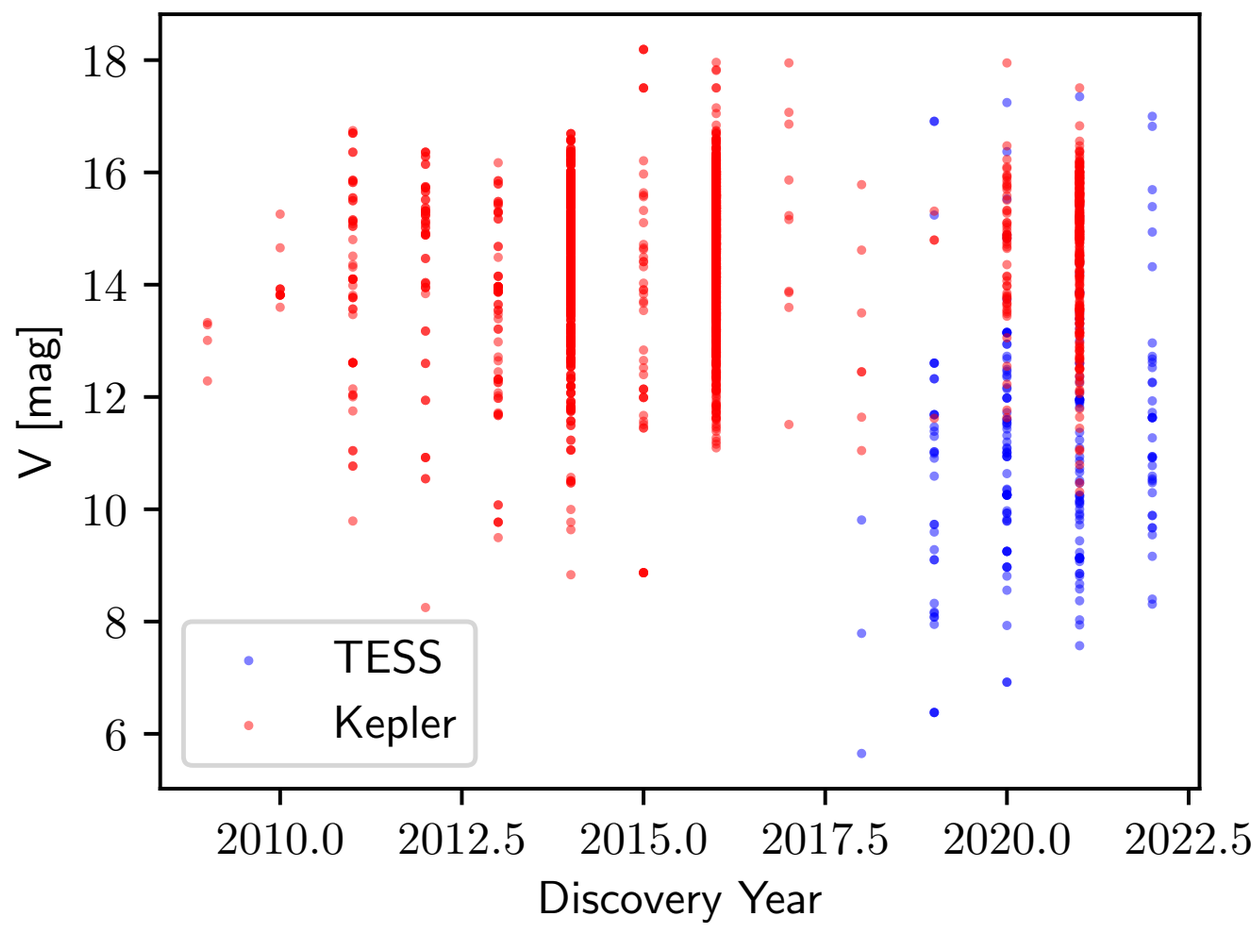
The TESS Mission

- Nevertheless, the actual scientific legacy of the TESS Mission will be in having discovered the largest sample of small exoplanets amenable to mass measurement and atmospheric characterization.



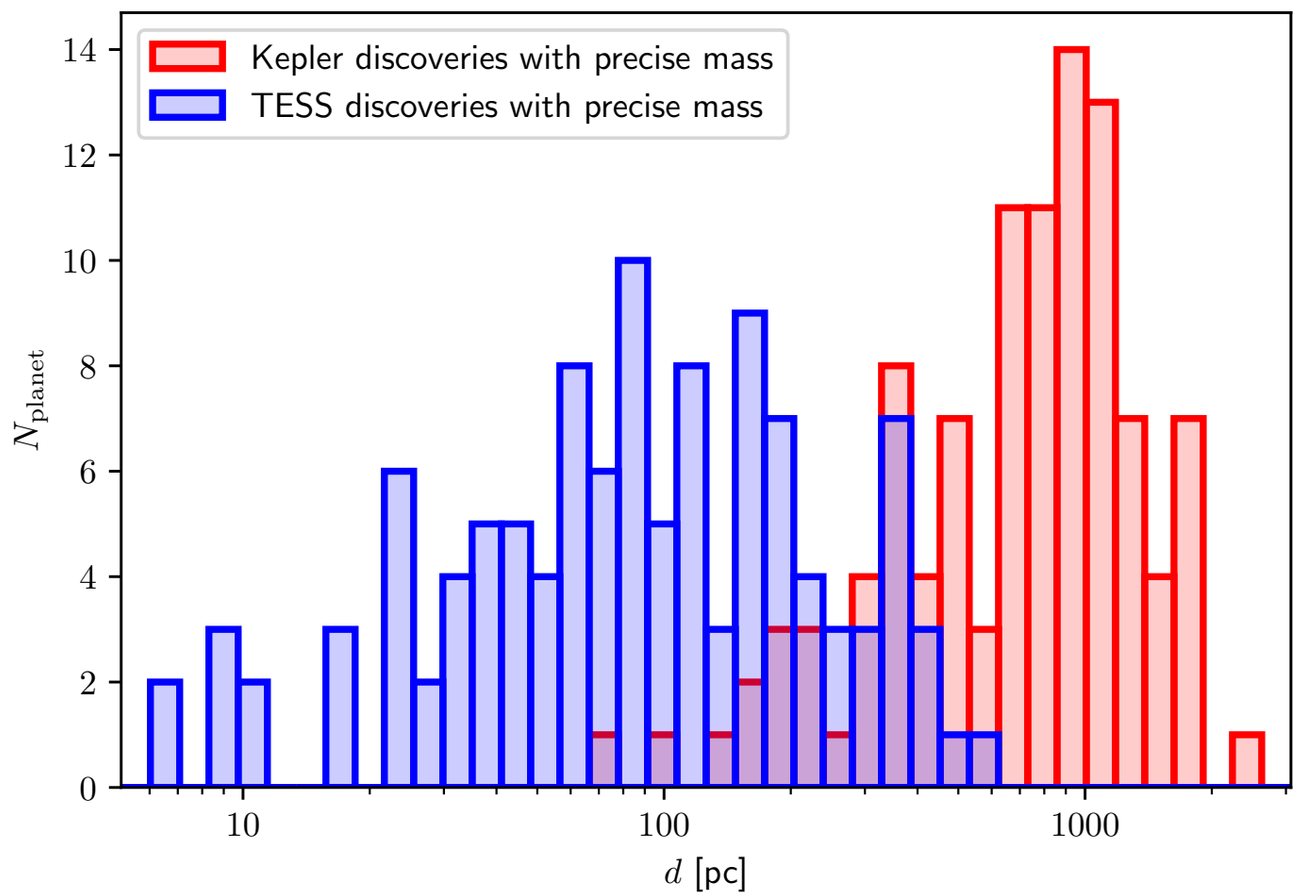
The TESS Mission

- Nevertheless, the actual scientific legacy of the TESS Mission will be in having discovered the largest sample of small exoplanets amenable to mass measurement and atmospheric characterization.



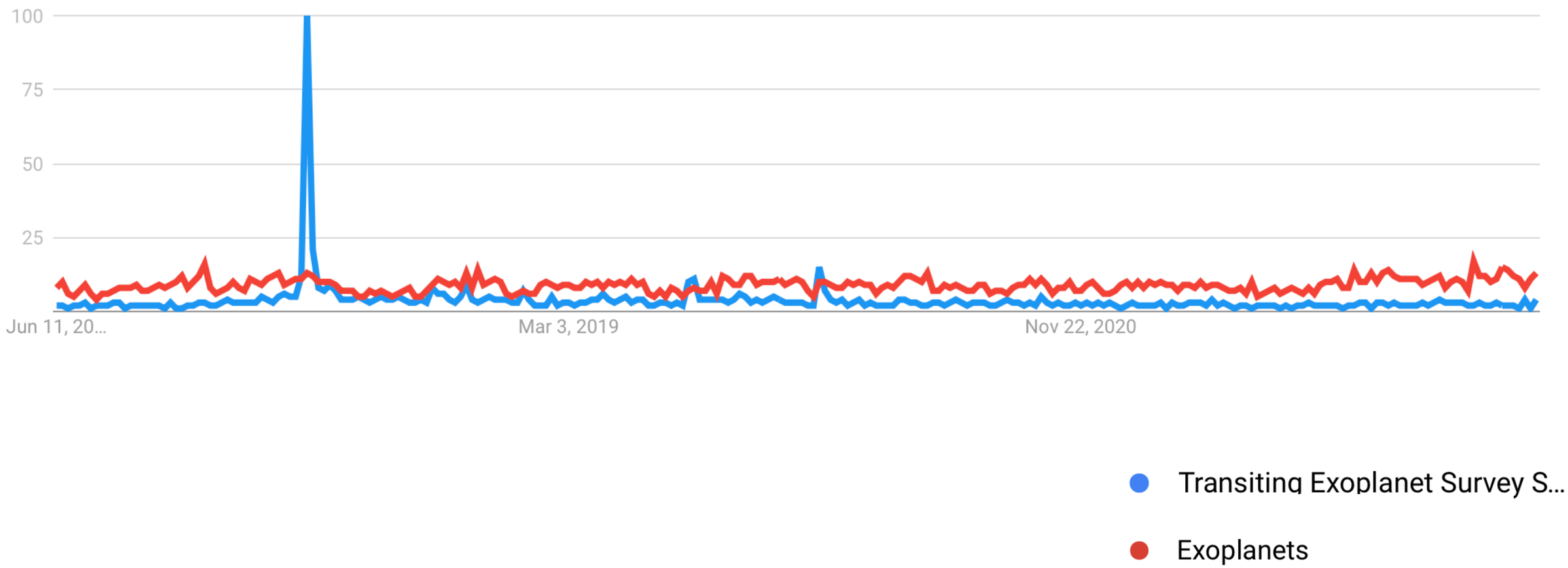
The TESS Mission

- Still, **in the eyes of the public**, the overall legacy of TESS will likely be that its exoplanet discoveries will, on the average, be the closest to our home in the Solar System.



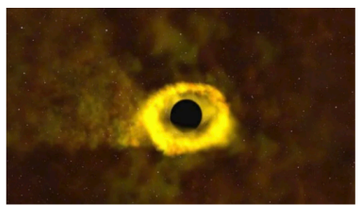
The public outreach footprint of TESS

- Research news from the TESS have been a major science outreach channel.



The public outreach footprint of TESS

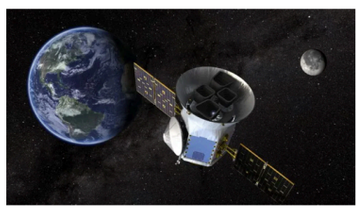
- Research news from the TESS have been a major science outreach channel.



SPACE SEPTEMBER 26, 2019

For the First Time, NASA's TESS Mission Spots Star-Shredding Black Hole [Video]

For the first time, NASA's planet-hunting Transiting Exoplanet Survey Satellite (TESS) watched a black hole tear apart a star in a cataclysmic phenomenon called a...



SPACE AUGUST 12, 2020

NASA's TESS – The Space Agency's "Planet Hunter" – Completes Its Primary Mission With "Roaring Success"

On July 4, NASA's Transiting Exoplanet Survey Satellite (TESS) finished its primary mission, imaging about 75% of the starry sky as part of a two-year-long...

SPACE OCTOBER 25, 2020

First Habitable-Zone, Earth-Sized Exoplanet Discovered With Planet-Hunter TESS

TESS, the Transiting Exoplanet Survey Satellite, was launched in 2018 with the goal of discovering small planets around the Sun's nearest neighbors, stars bright enough...

SPACE JUNE 30, 2020

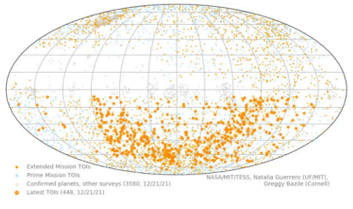
NASA's TESS Investigates Strange Ultrahot World – "The Weirdness Factor Is High With KELT-9 b"

Measurements from NASA's Transiting Exoplanet Survey Satellite (TESS) have enabled astronomers to greatly improve their understanding of the bizarre environment of KELT-9 b, one of...

SPACE FEBRUARY 6, 2021

Four New Exoplanets Orbiting a Nearby Sun-Like Star Discovered by TESS

MIT-led NASA mission finds a multi-planetary system that could be an "ideal laboratory" to study planetary formation and evolution. MIT researchers have discovered four new...



SPACE JANUARY 24, 2022

Doubling Planets: TESS Science Office at MIT Hits Milestone of 5,000 Exoplanet Candidates

Catalog of planet candidates nearly doubles in size during 2020-21. The catalog of planet candidates found with NASA's Transiting Exoplanet Survey Satellite (TESS) recently passed...

https://scitechdaily.com/

Science Communication

- Science communication or outreach is any effort individual scientists, universities, museums, or research institutes make to promote the public understanding and awareness of research results and the scientific method itself.

History of science outreach

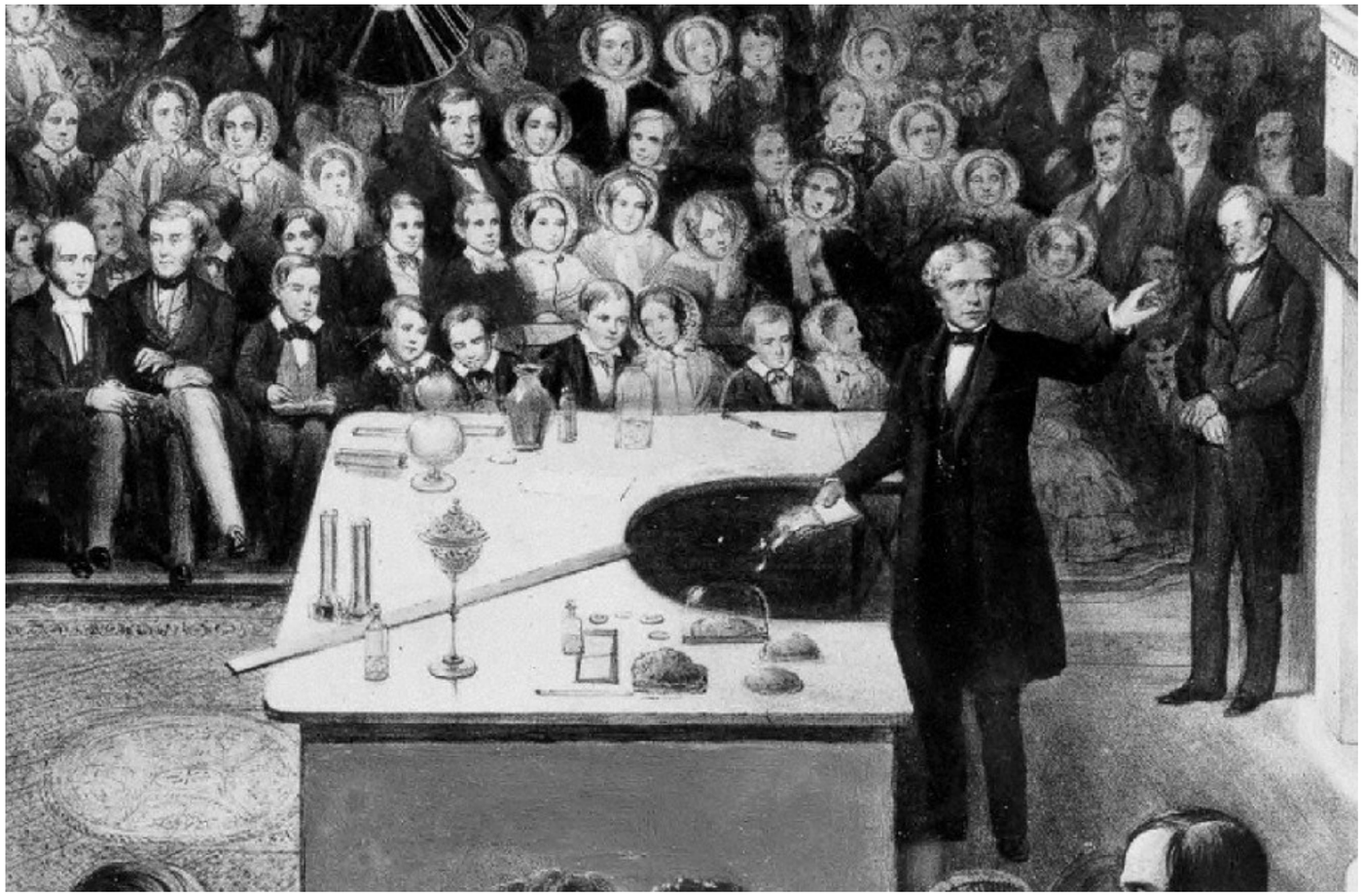
- Early forms of science communication was mixed into research (e.g., On the Origin of Species by Means of Natural Selection, 1859).

History of science outreach

- Historically, science has been funded by rich or powerful individuals (i.e., patrons). Since it was not funded by the public, scientists and institutions had little or no interest in making science available to the public.

History of science outreach

- Royal Institution Christmas Lectures is a series of public lectures that have been held almost continuously since 1825.



Alexander Blaikley

History of science outreach

- Government and tax-payer support for science has dramatically changed how scientific results are reflected onto the society.

Motivations for better science communication

- Augmented domestic support for students choosing a career as a scientist
- Improved public scientific literacy
  - Better decision and policy making in the society
  - Increased support and funding for science
- Richer opportunities for professional developments of scientists
- Dissemination of research-generated knowledge beyond academia

Methods for better science communication

- Knowing your audience
- Implementing flipped interaction settings
- Seeking funding when necessary
- Getting feedback from the audience
- Avoiding jargon, but not necessarily complexity.
- Using scales drawn from everyday life.

Public perception of concepts in science

- When doing science outreach, it is helpful to put yourself in lieu of your audience.
- Scientists adopt theories after following a set of observations.
- In contrast, in the absence of training on the scientific method, public perception of concepts typically **start** with theories. This blurs their view of uncertainty and makes it vague what is observationally supported and the role of the observations in this support.

Astronomy and human mind

- Astronomy
  - is the earliest of all scientific endeavors,
  - in its essence, relies on the simple and intuitive concept of mapping the brightness of the celestial sphere in every direction, at every wavelength, and as a function of time,
  - and easily appeals to human imagination.

Misconceptions in astronomy

- Yet it still carries on historical conceptual artifacts:
  - Magnitude system
  - Early and late type stars
  - Planetary nebula

Outline of the workshop

In this workshop, we will focus on the following aspects of science communication:

- Common public misconceptions of exoplanets and TESS data and how to address them
- Methods of effective data visualization relevant to exoplanets and TESS
- How to request media coverage of your research results as a researcher
- How TESS citizen science contributes to science outreach

Outline of the workshop

12:30 PM - 1:00 PM	Introduction (Tansu)
1:00 PM - 1:30 PM	Emma Chickles (e.g. public misconceptions of exoplanets)
1:30 PM - 1:45 PM	Coffee break
1:45 PM - 2:15 PM	Nora Eisner on Planet Hunters TESS (likely remote, on zoom, 30 minutes)
2:15 PM - 2:50 PM	Pair / group activity (led by Emma, 35 minutes)
2:50 PM - 3:20 PM	Yadira Gaibor (e.g. visualizations, animations, posters, models)
3:20 PM - 3:55 PM	Pair / group activity (led by Yadira, 35 minutes)
3:55 PM - 4:10 PM	Coffee break (Give out outreach materials (e.g., stickers, lithographs, and pamphlets) provided by the TESS GI Office)
4:10 PM - 4:30 PM	**Rebekah Hounsell (UMBC) on TESS GI Office (15 minutes)**
4:30 PM - 4:50 PM	Claire Andreoli (NASA Goddard) on requesting NASA media coverage of research results, ExEP (15 minutes)
4:50 PM - 5:00 PM	Feedback, Final remarks (Tansu)

Remaining of the workshop

Please do not hesitate to interrupt any presentation with questios, because we would like to make it as interactive as possible.