TESS Transit light curve

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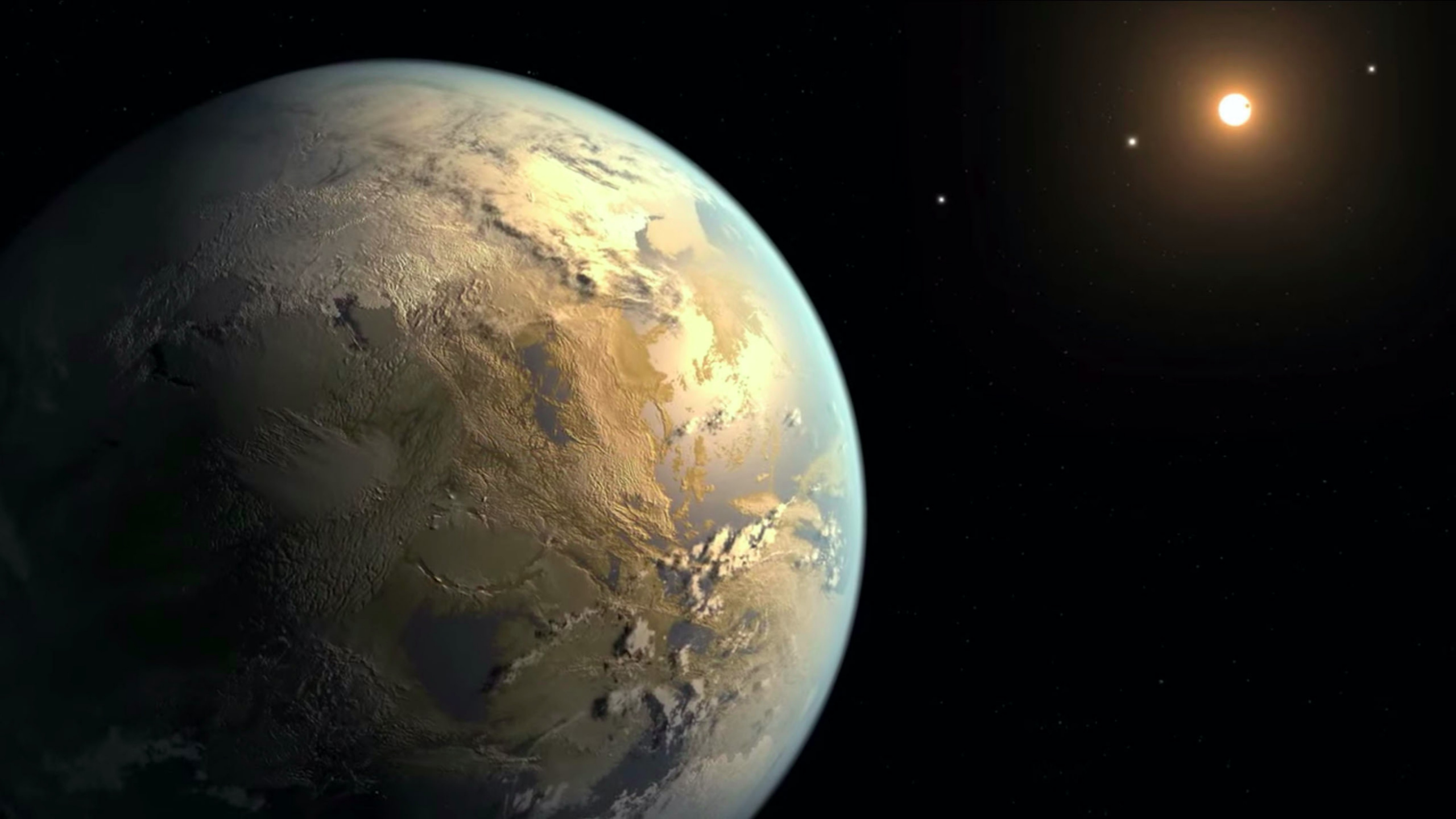
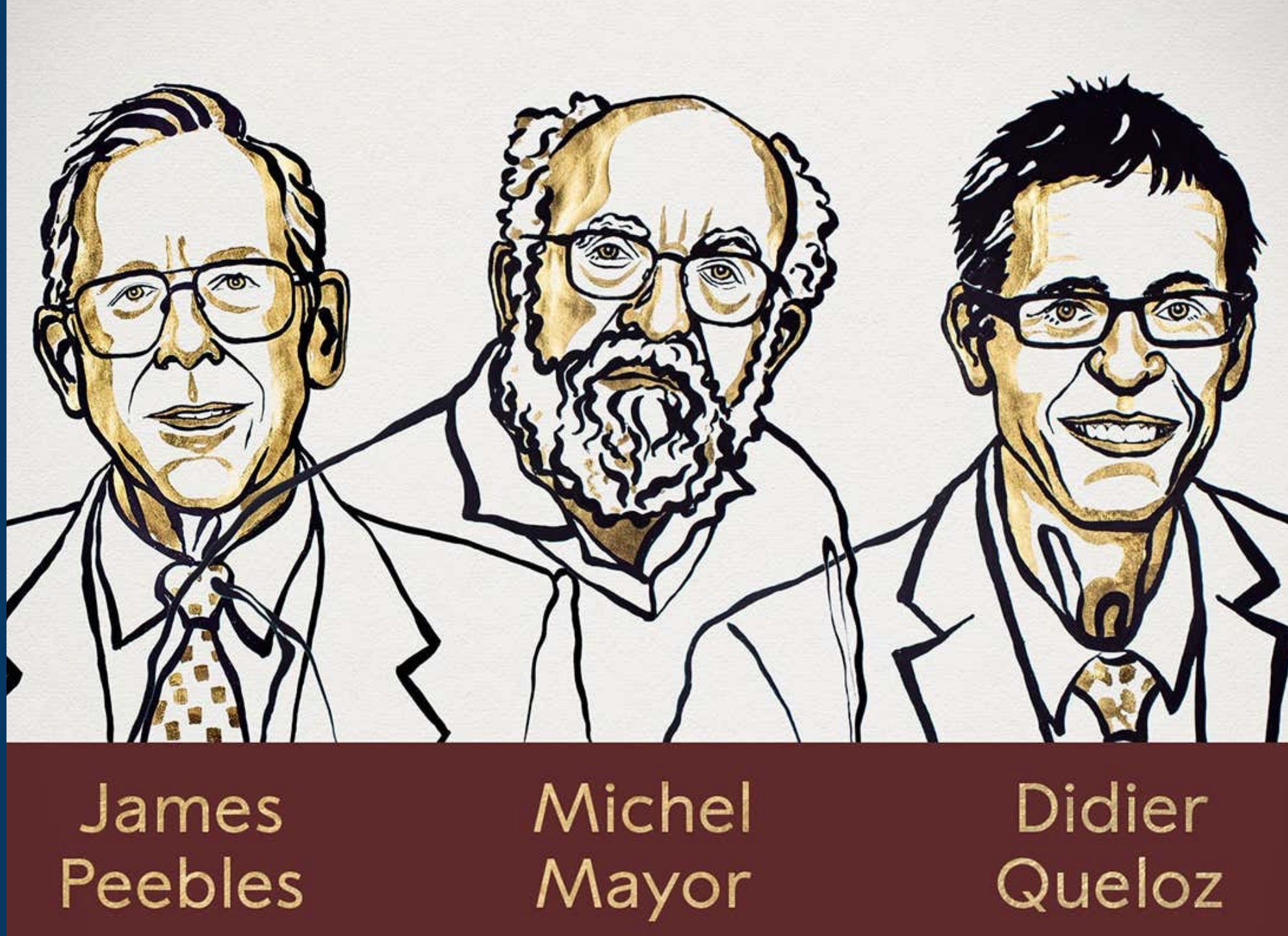
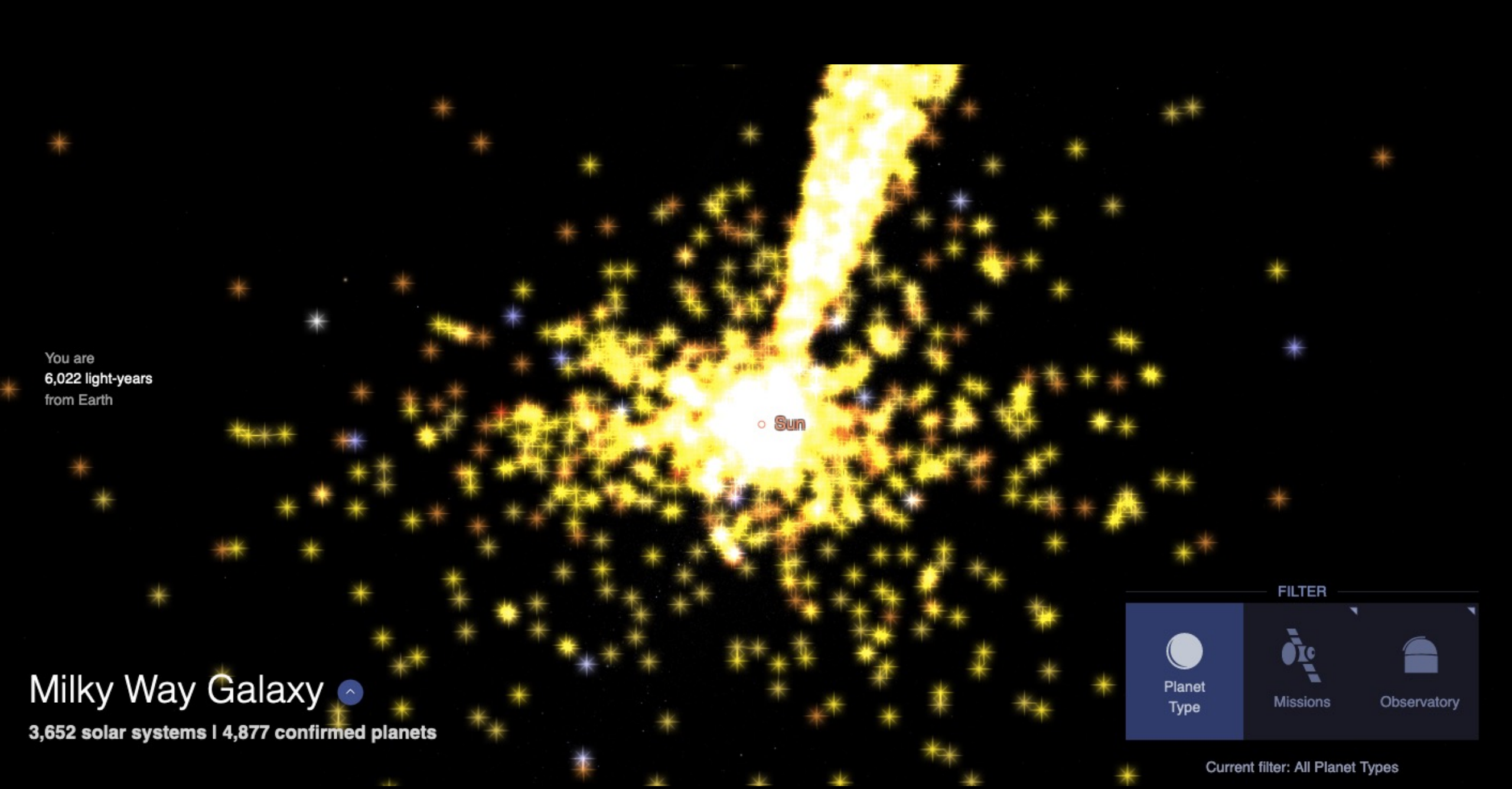


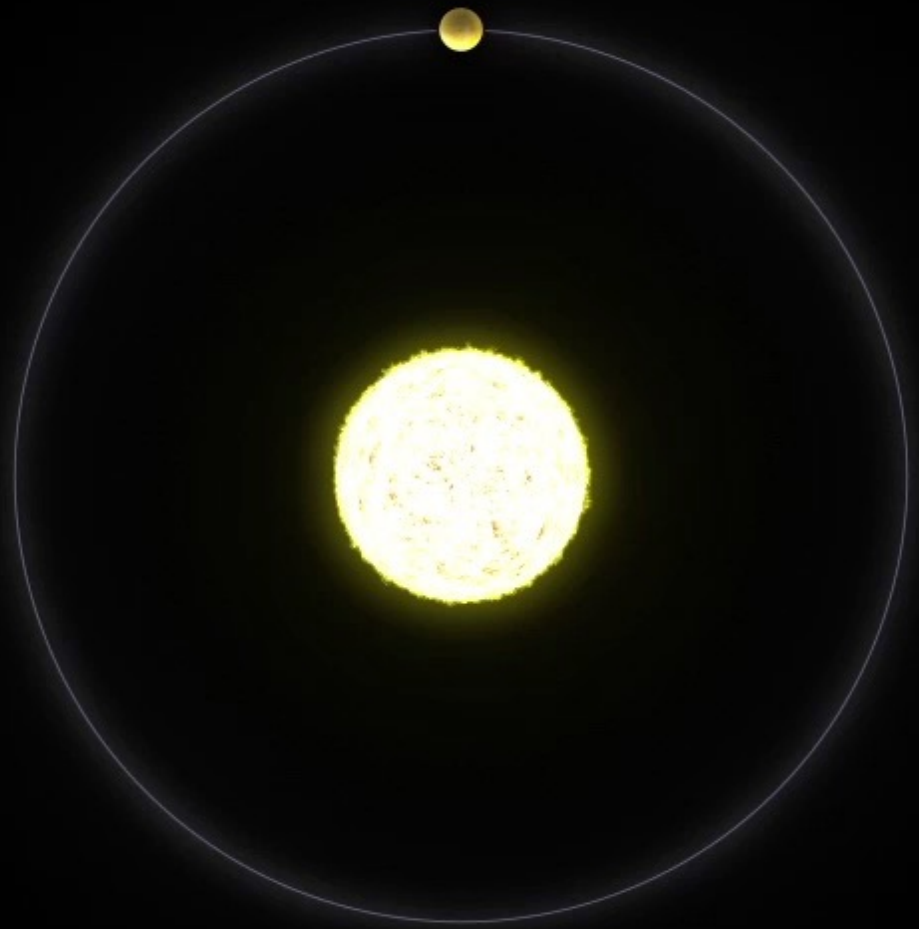
NOBEL PRIZES IN PHYSICS 2019




You are
6,022 light-years
from Earth
Sun
Milky Way Galaxy
3,652 solar systems | 4,877 confirmed planets
FILTER
Planet Type
Missions
Observatory
Current filter: All Planet Types

Telescope Bearing
↔ 336.55°NW
↕ 49.39°

Taguig, Metro Manila, Philippines CHANGE LOCATION



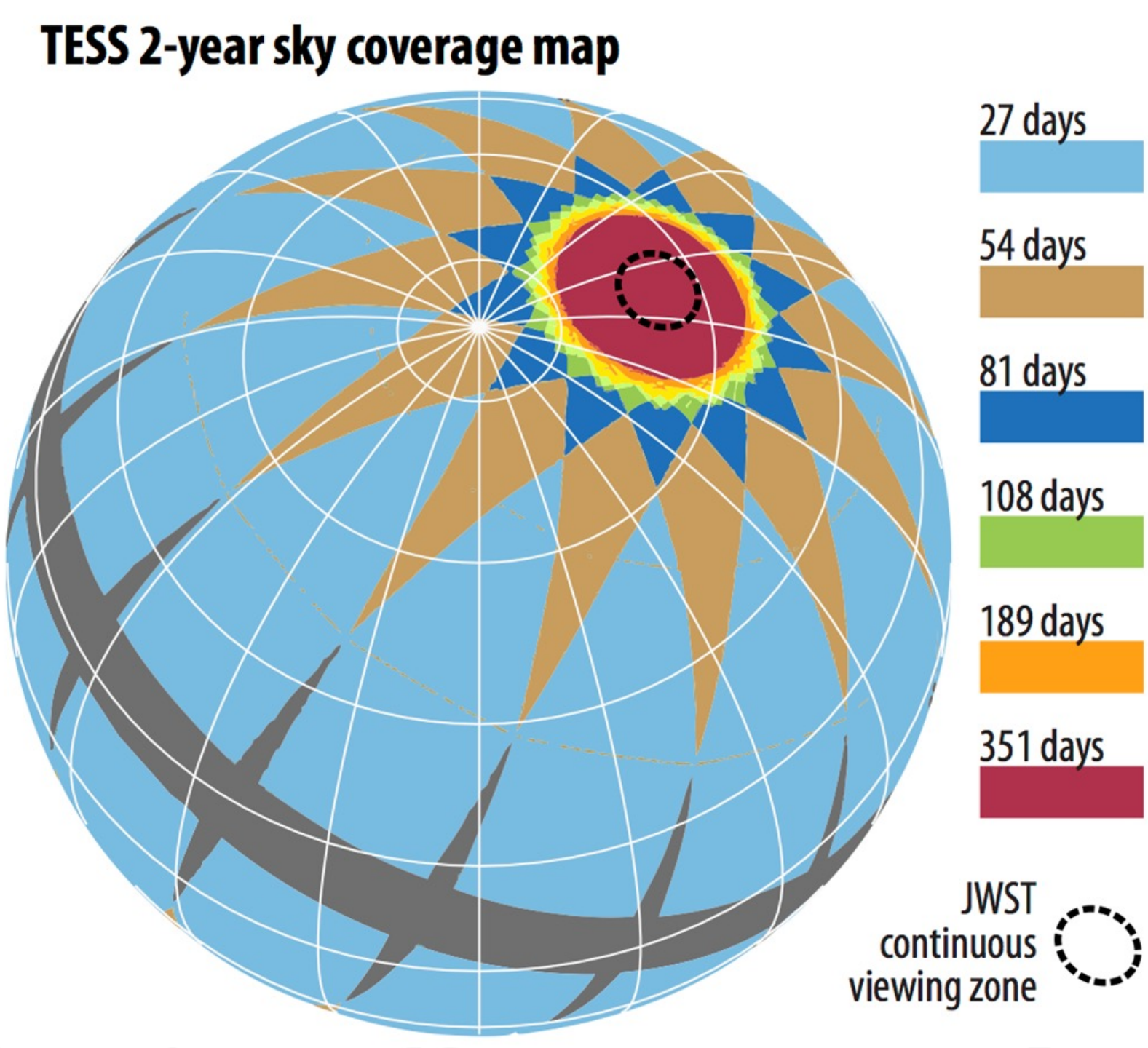

LIGHT
TIME

TESS

TRANSITING EXOPLANET SURVEY SATELITE

TESS

TRANSITING EXOPLANET SURVEY SATELITE



TESS

TRANSITING EXOPLANET SURVEY SATELITE

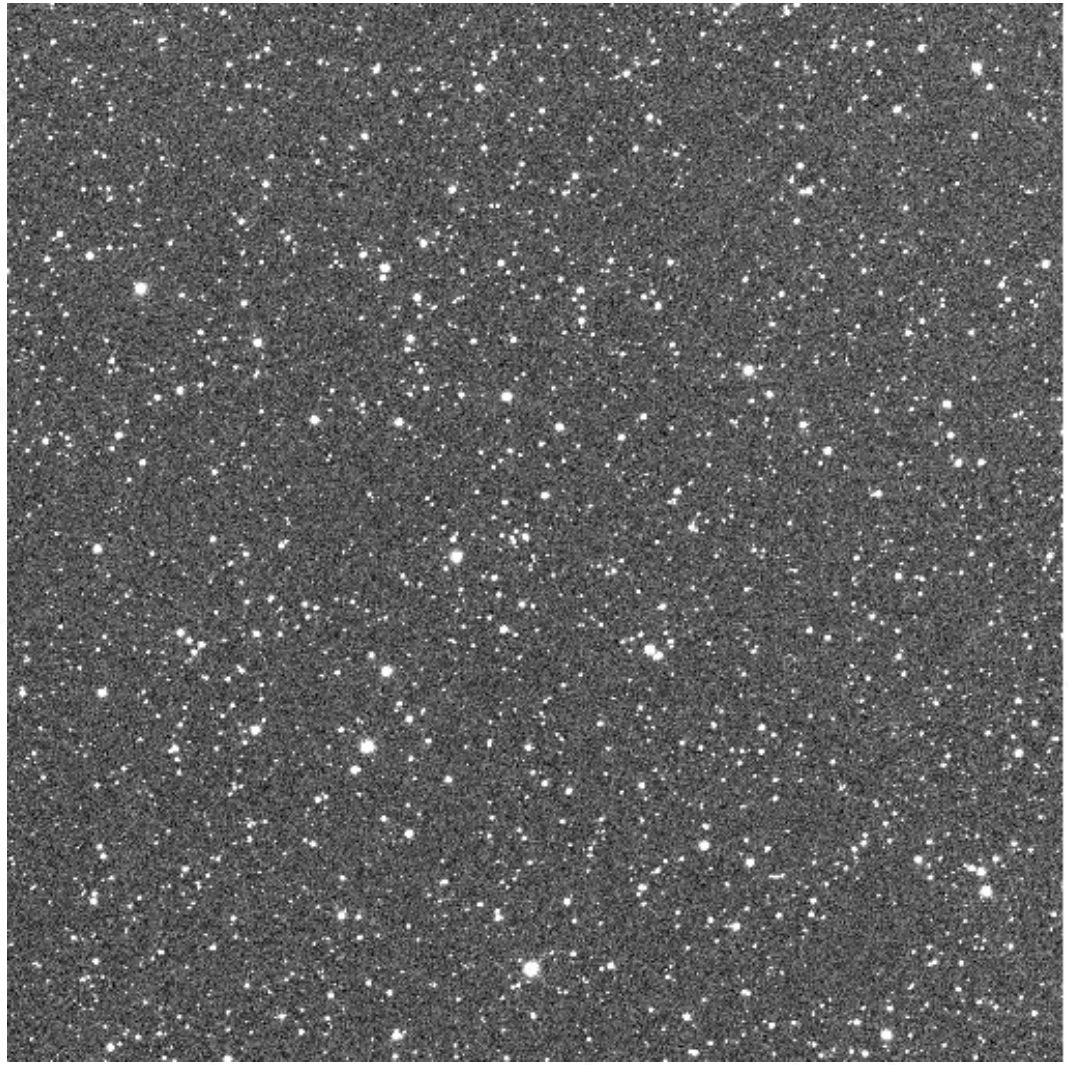
TESS has four identical cameras.

- Each has a 24×24 degree field of view
- They are aligned to cover 24×90 degree strips of the sky called “sectors.”
- Each camera has four 2k x 2k CCDs with a pixel scale of 21 arcseconds per pixel.
- The detectors are sensitive from 600-1000nm (blue to the near-IR).

Every sector, the TESS spacecraft will downlink about 200,000 two-minute cadence postage stamps, as well as full frame images binned on board at a 30-minute cadence.

The team has prepared the TESS Input Catalog (TIC) of over 1 billion objects, with a special subset Candidate Target List (CTL) of 200,000 objects for the two-minute cadence observations.

MAGNITUE, POSITION and TIME

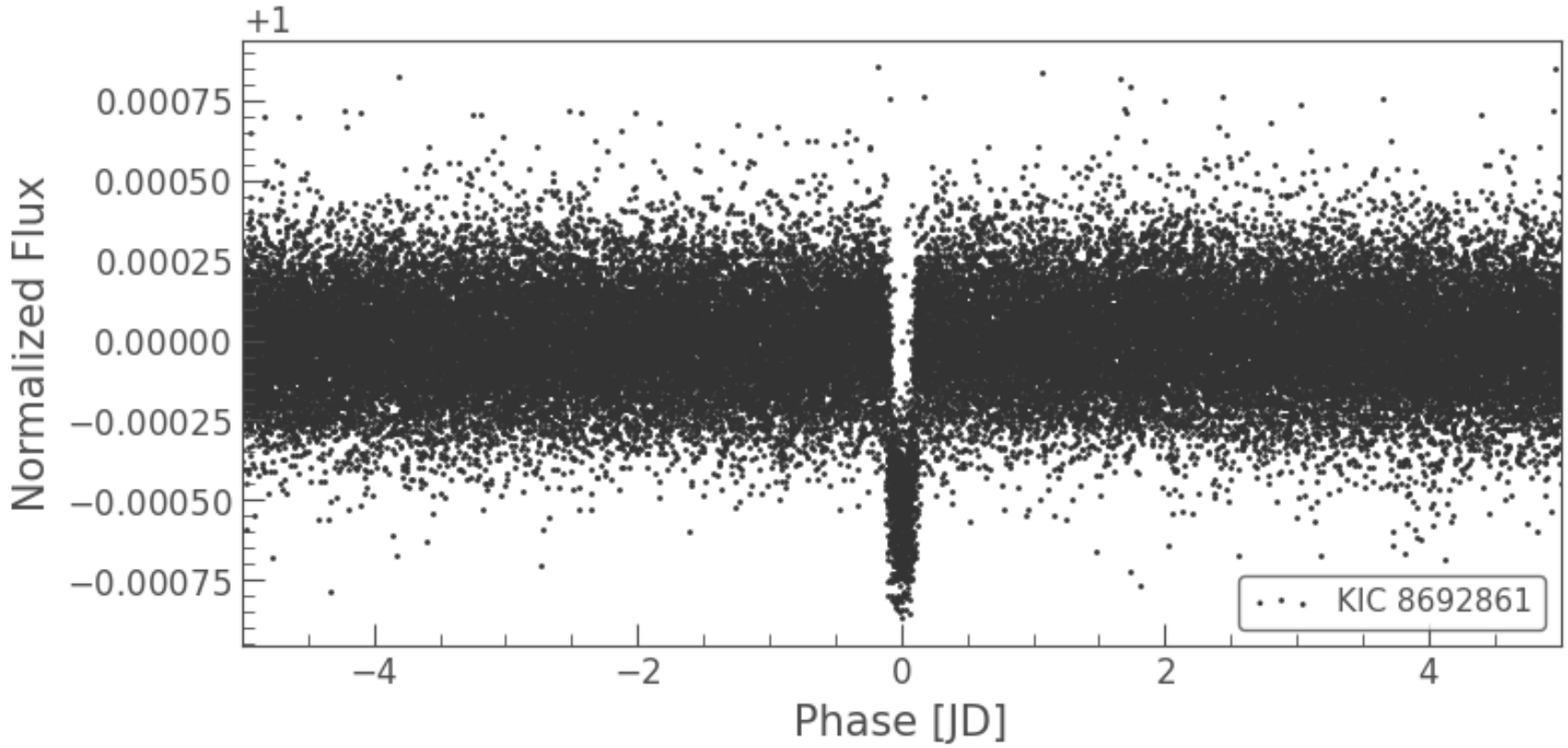


- Magnitude

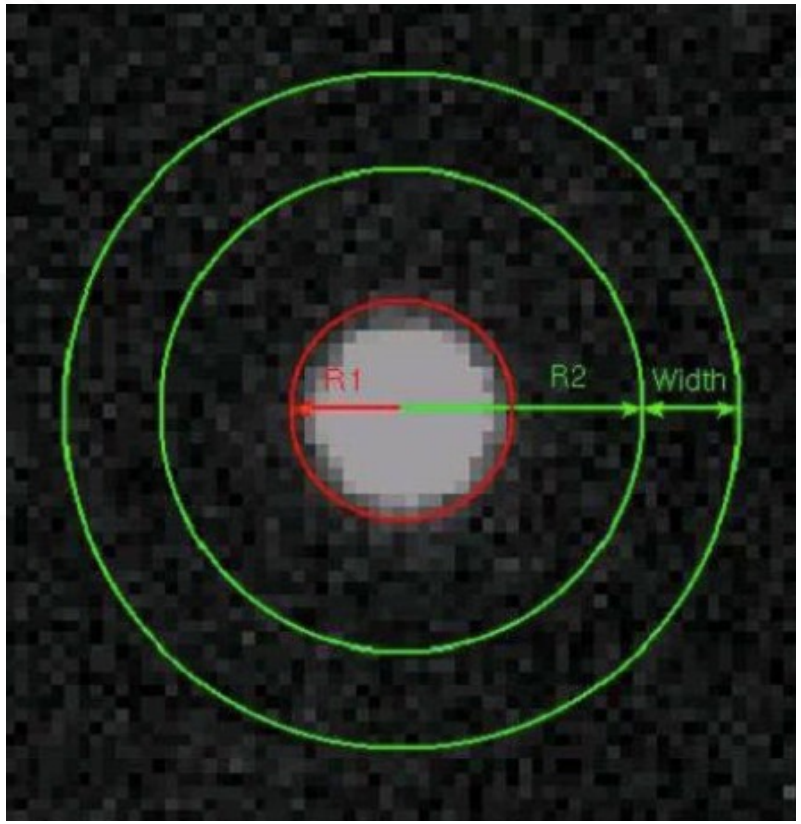
$$m_1 - m_2 = -2.5 \log \frac{I_1}{I_2}$$

- Position (RA, Dec)
- Time
  - Local time
  - Coordinated Universal Time: UTC
  - Julian Date: JD
  - Heliocentric Julian Date: HJD
  - Barycentric Julian Date: BJD

LIGHT CURVE


+1
0.00075
0.00050
0.00025
0.00000
−0.00025
−0.00050
−0.00075
Normalized Flux
−4
−2
0
2
4
Phase [JD]
KIC 8692861

APERTURE PHOTOMETRY



- R_1 Star radius
- R_2 Inner sky radius
- Width Sky background width

$$Signal_{star} = Signal_{in\ R_1} - \overline{Signal_{in\ width}} \times \frac{A_{in\ R_1}}{A_{in\ width}}$$

APERTURE PHOTOMETRY

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)}$$

$$FWHM = 2\sigma\sqrt{2\ln 2} \approx 2.35\sigma$$

- Two dimensional Gaussian function

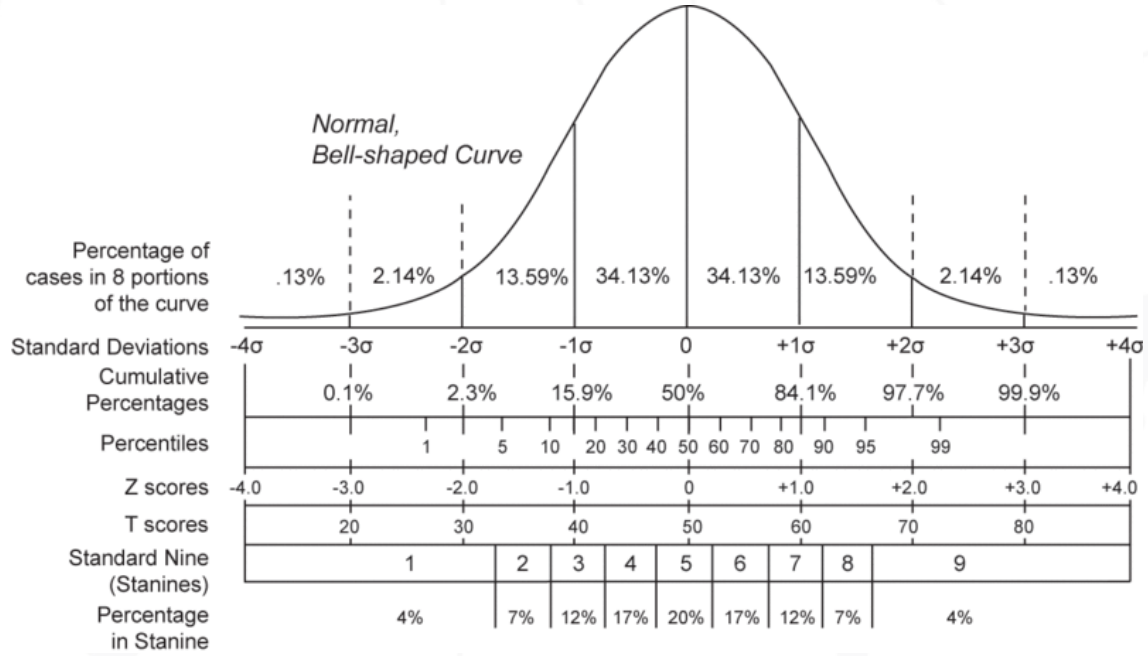
$$f(x,y) = \frac{1}{2\pi\sigma_x^2\sigma_y^2} e^{\left(-\frac{x^2}{2\sigma_x^2}\right)} e^{\left(-\frac{y^2}{2\sigma_y^2}\right)}$$

$$e^{\left(-\frac{r^2}{2\sigma^2}\right)}\Big|_0^{\sigma} = 0.3935$$

$$e^{\left(-\frac{r^2}{2\sigma^2}\right)}\Big|_0^{2\sigma} = 0.8647$$

$$e^{\left(-\frac{r^2}{2\sigma^2}\right)}\Big|_0^{4\sigma} = 0.9889$$

$$e^{\left(-\frac{r^2}{2\sigma^2}\right)}\Big|_0^{5\sigma} = 0.999996$$



Credit: http://exoplanet.as.arizona.edu

GOOGLE COLAB

https://cmu.to/uEHWB