National Aeronautics and Space Administration

Astrophysics

AAAC Science Presentation

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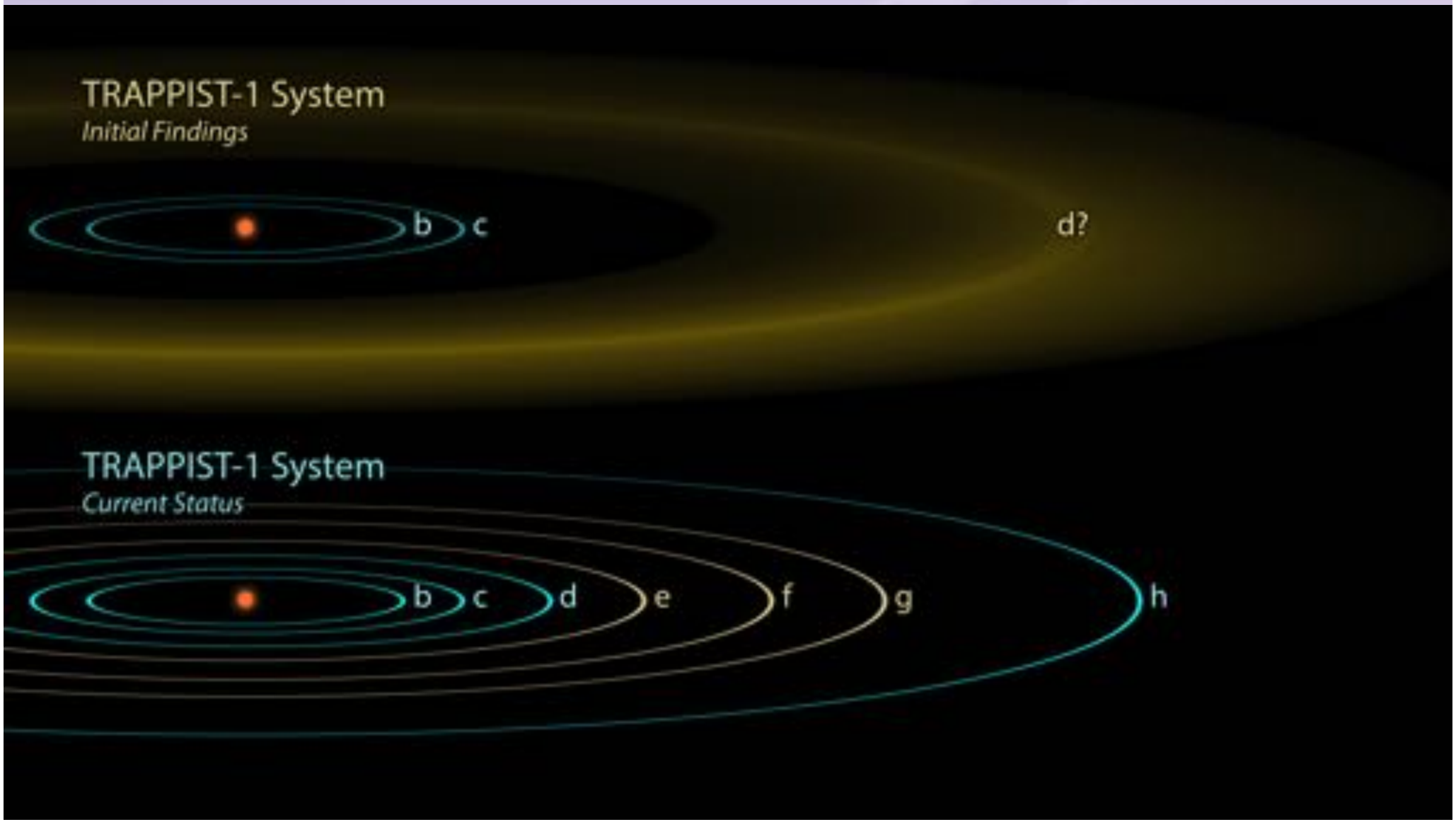
Discovery of the TRAPPIST-1 Planets



Gillon et al., 2017, Nature, 542, 456

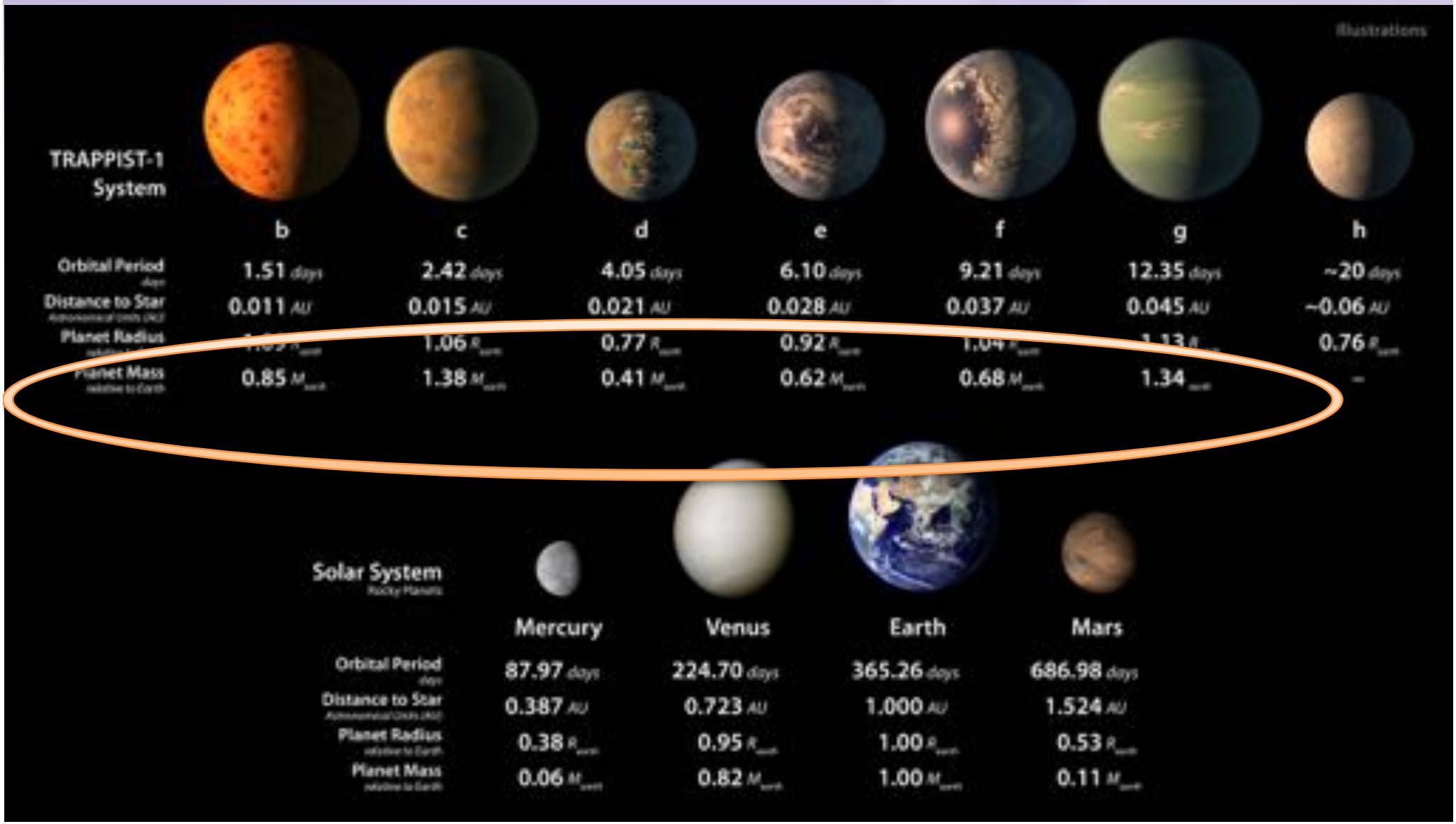
Graphics courtesy: NASA/JPL-Caltech/ R. Hurt (IPAC)

TRAPPIST-1 System

Gillon et al., 2017, Nature, 542, 456

Graphics courtesy: NASA/JPL-Caltech

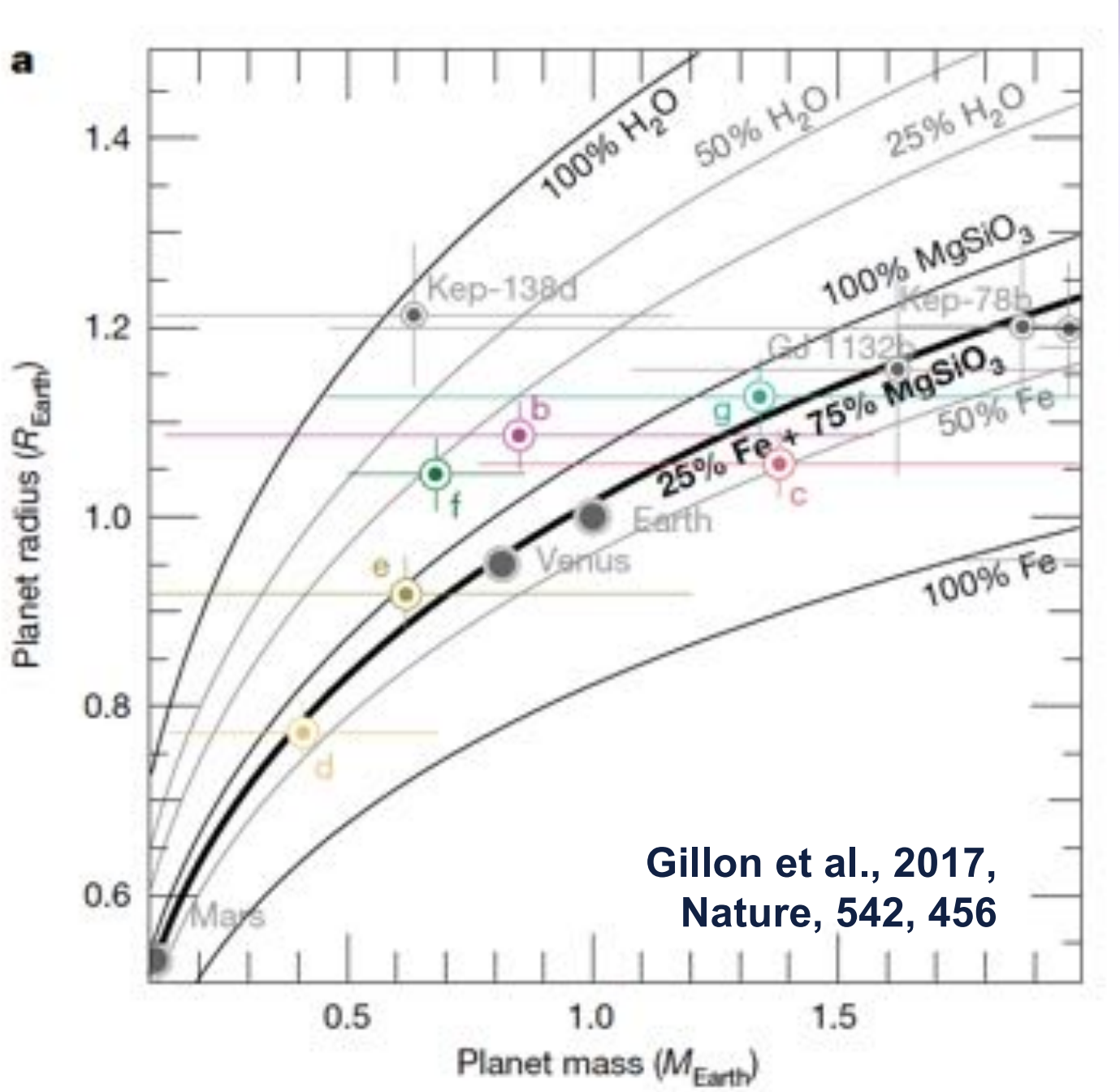
TRAPPIST-1 System



Gillon et al., 2017, Nature, 542, 456

Graphics courtesy: NASA/JPL-Caltech/ R. Hurt, T. Pyle (IPAC)

Planetary Composition

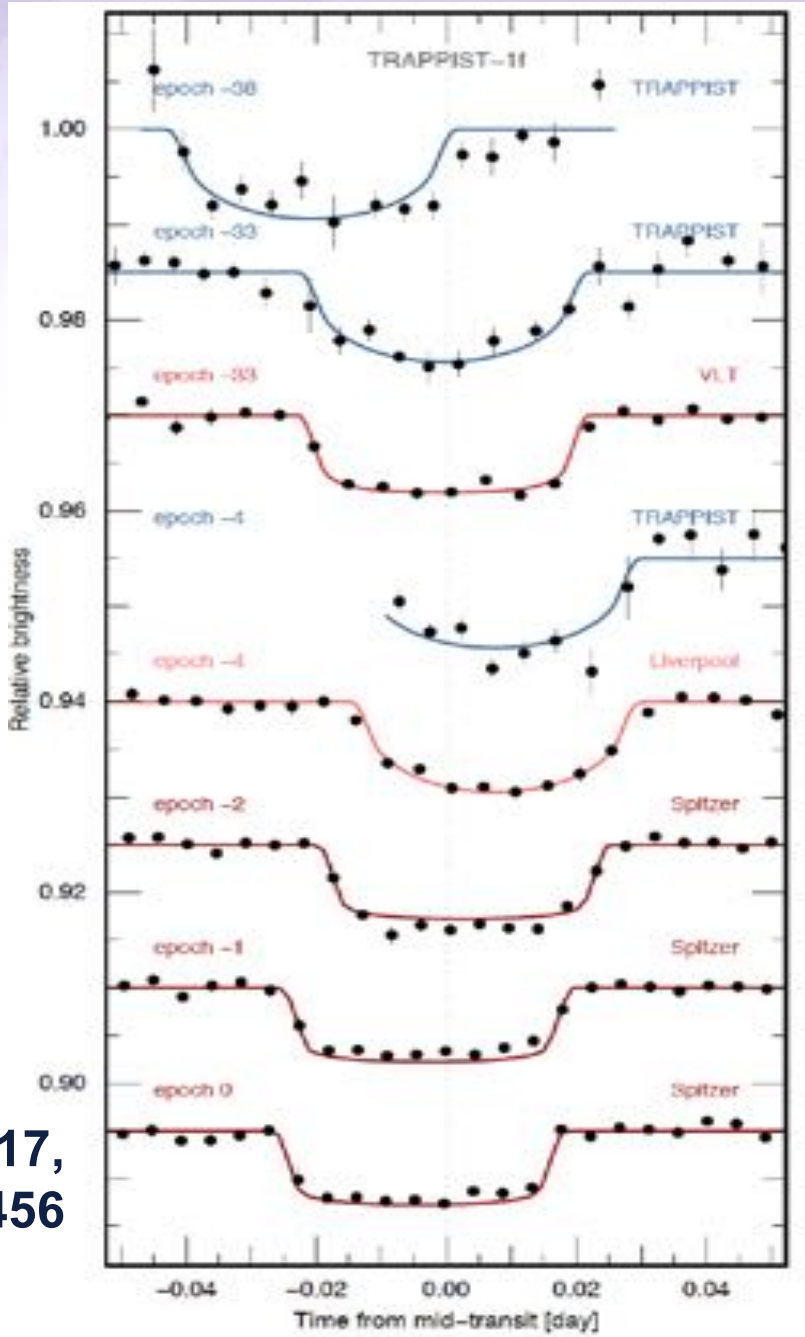


Gillon et al., 2017, Nature, 542, 456

- Mass estimates for the six inner planets suggests rocky compositions.
- Precision of mass estimates not yet sufficient to constrain fraction of volatiles
- Need follow up with Hubble, Webb to better understand atmospheric conditions

Transit Timing Variations

- Inner planets form a near-resonant chain
  - Pc/Pb, Pd/Pc, Pe/Pd, Pf/Pe, Pg/Pf: 8/5, 5/3, 3/2, 3/2, 4/3
  - Substantial TTVs – from few 10s to 30 minutes
  - Favored theoretical model → disk-driven inward migration (Cresswell et al. 2006; Terquen et al. 2007)
  - Implication is planets should have a volatile rich composition (reflecting where they formed) with lower densities than Earth.

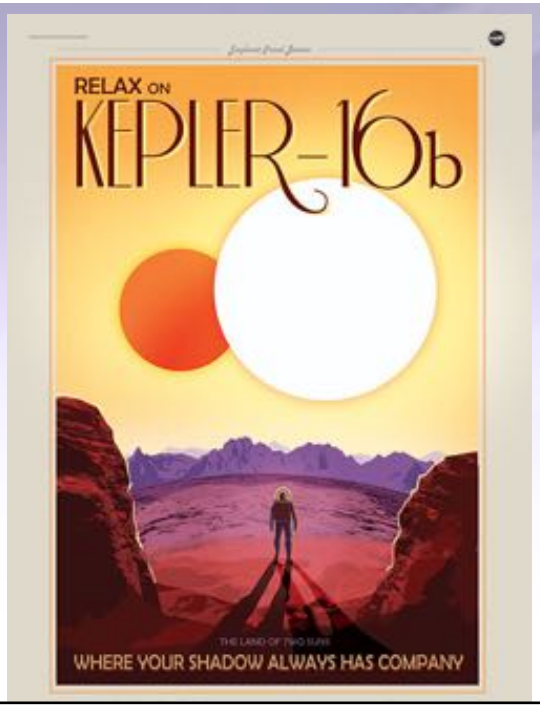


Gillon et al., 2017, Nature, 542, 456

Scene from TRAPPIST-1e

Graphics courtesy: NASA/JPL-Caltech/T. Pyle (IPAC)

ASTROPHYSICS



https://exoplanets.nasa.gov/alien-worlds/exoplanet-travel-bureau/

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