

Robert Lamontagne




Centre de recherche en astrophysique du Québec



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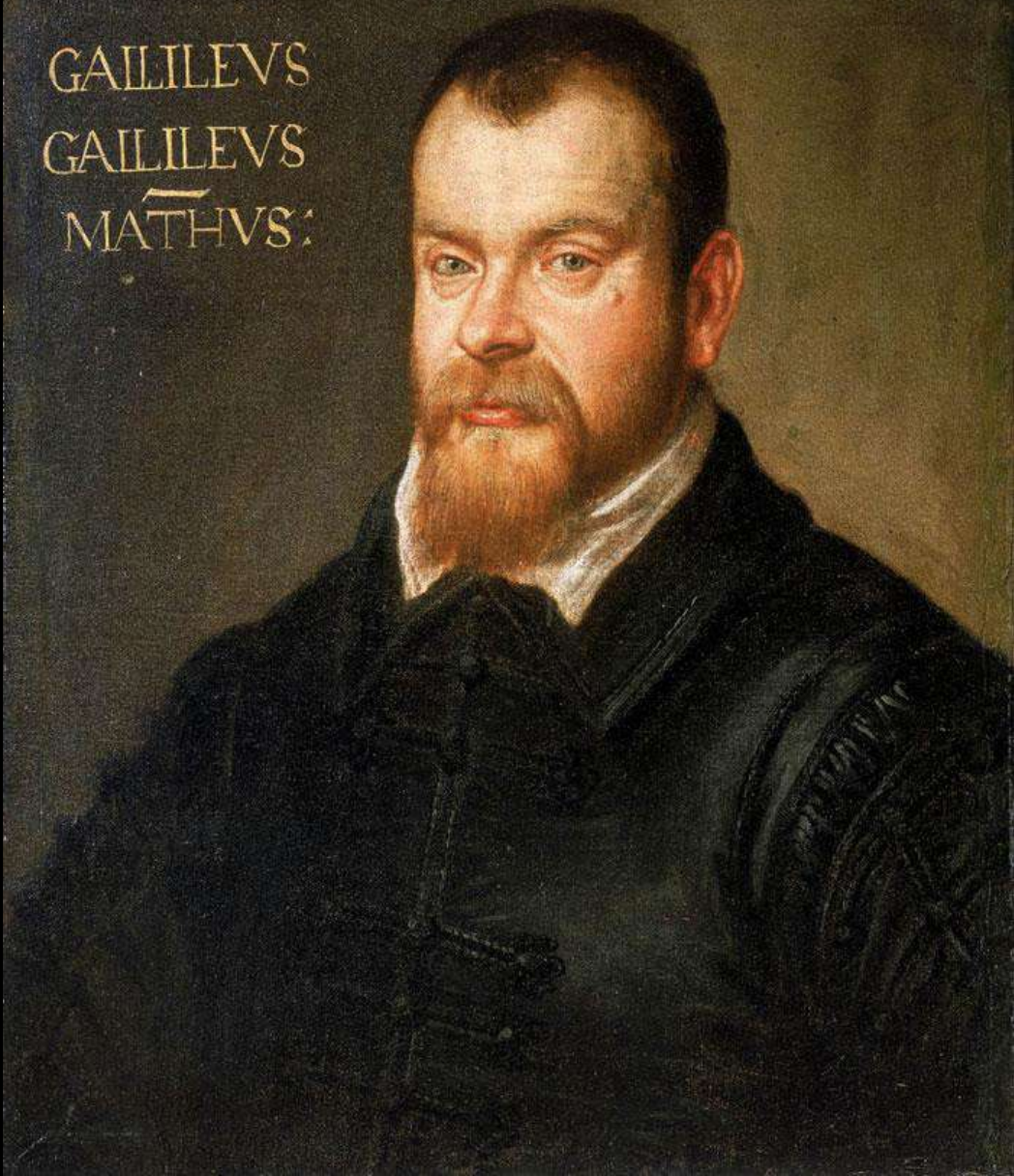


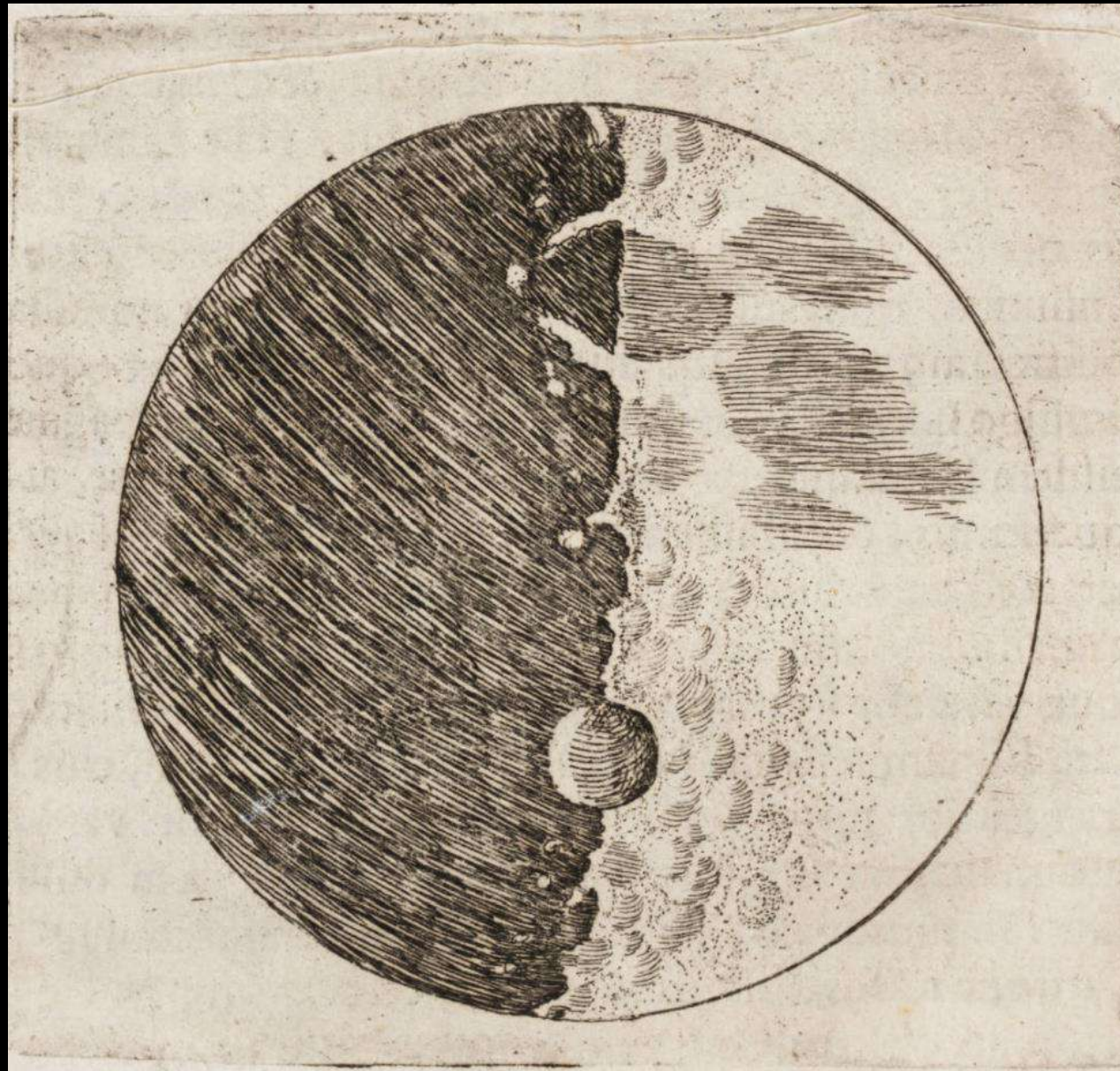
La recherche de
la vie ailleurs
dans le cosmos

« Fais-nous encore connaître ce qu'est vraiment le ciel, ce que sont vraiment les planètes de tous les astres; comment les mondes infinis sont distincts les uns des autres. »

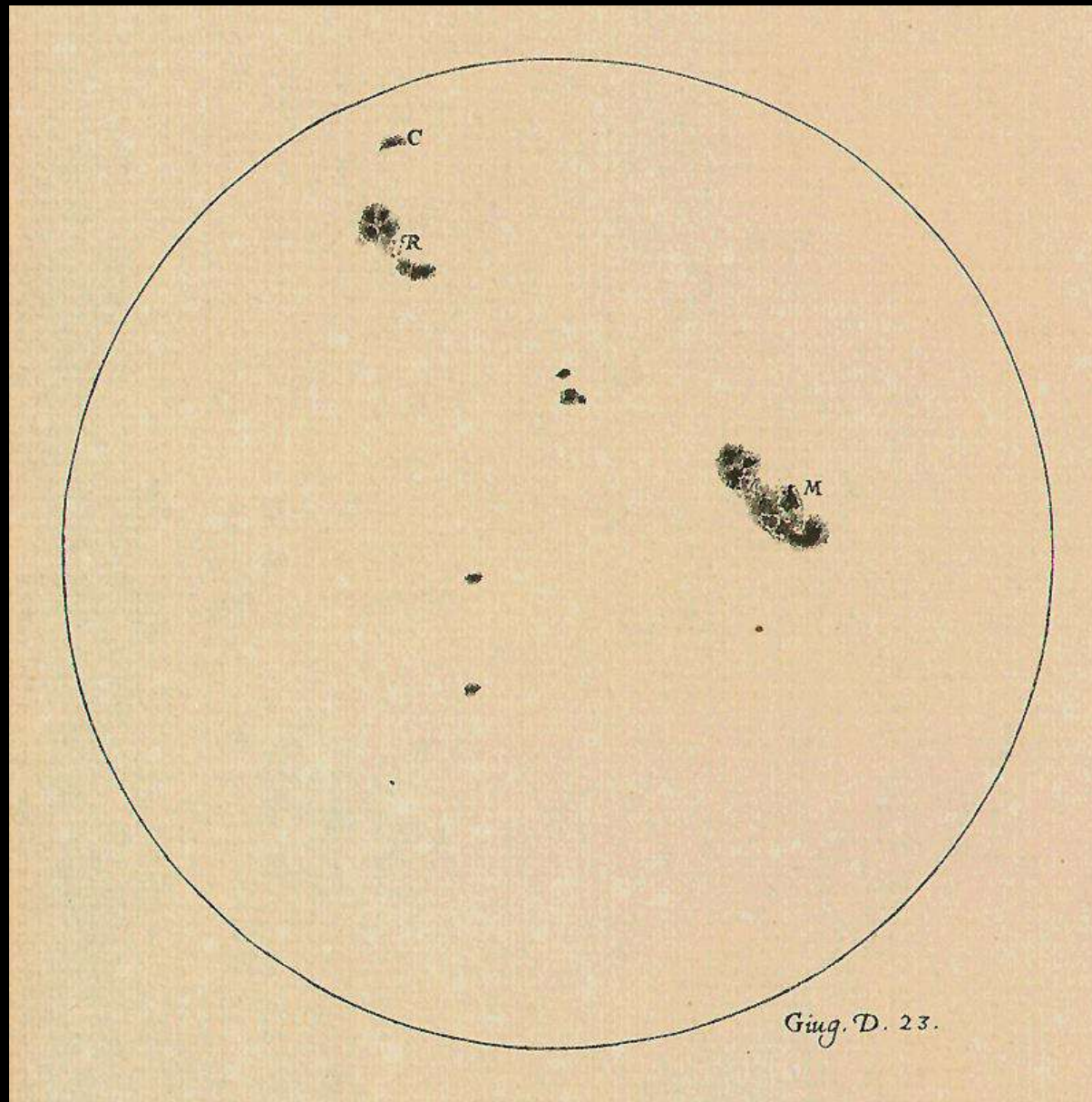
Giordano Bruno, De l'Infinito, Universo e Mondi (1584)

GAILILEVS
GAILILEVS
MATHVS:

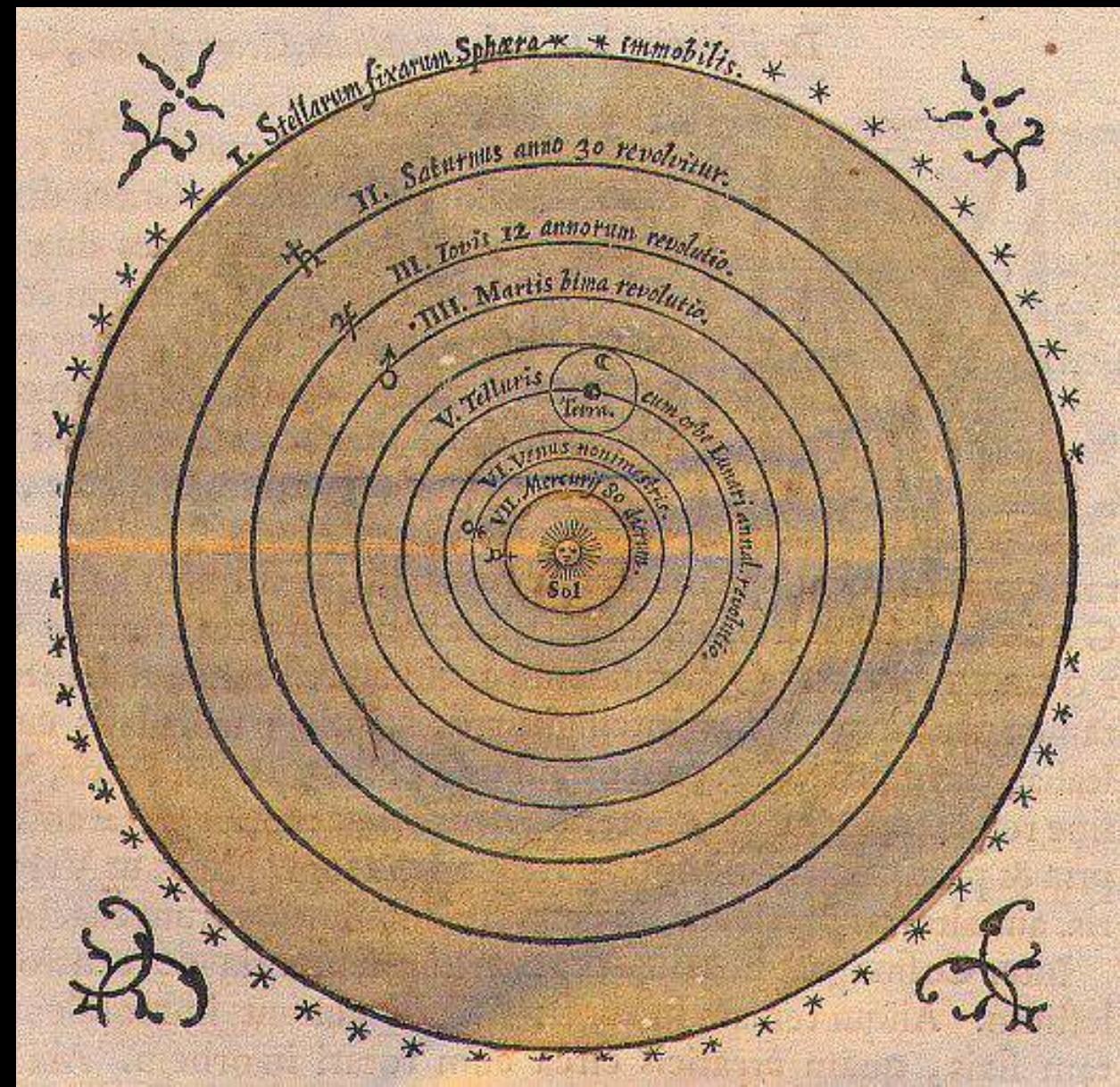
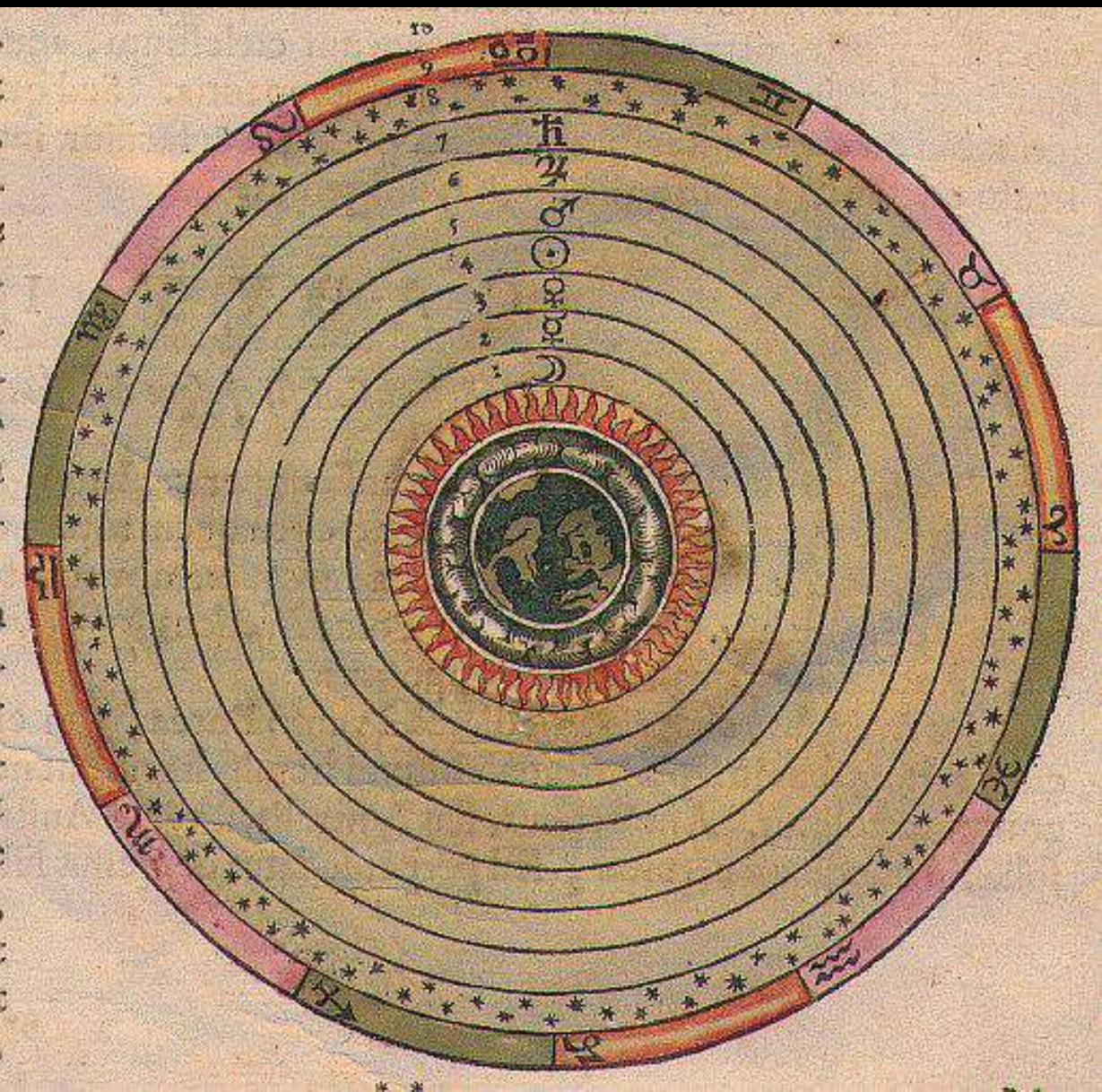




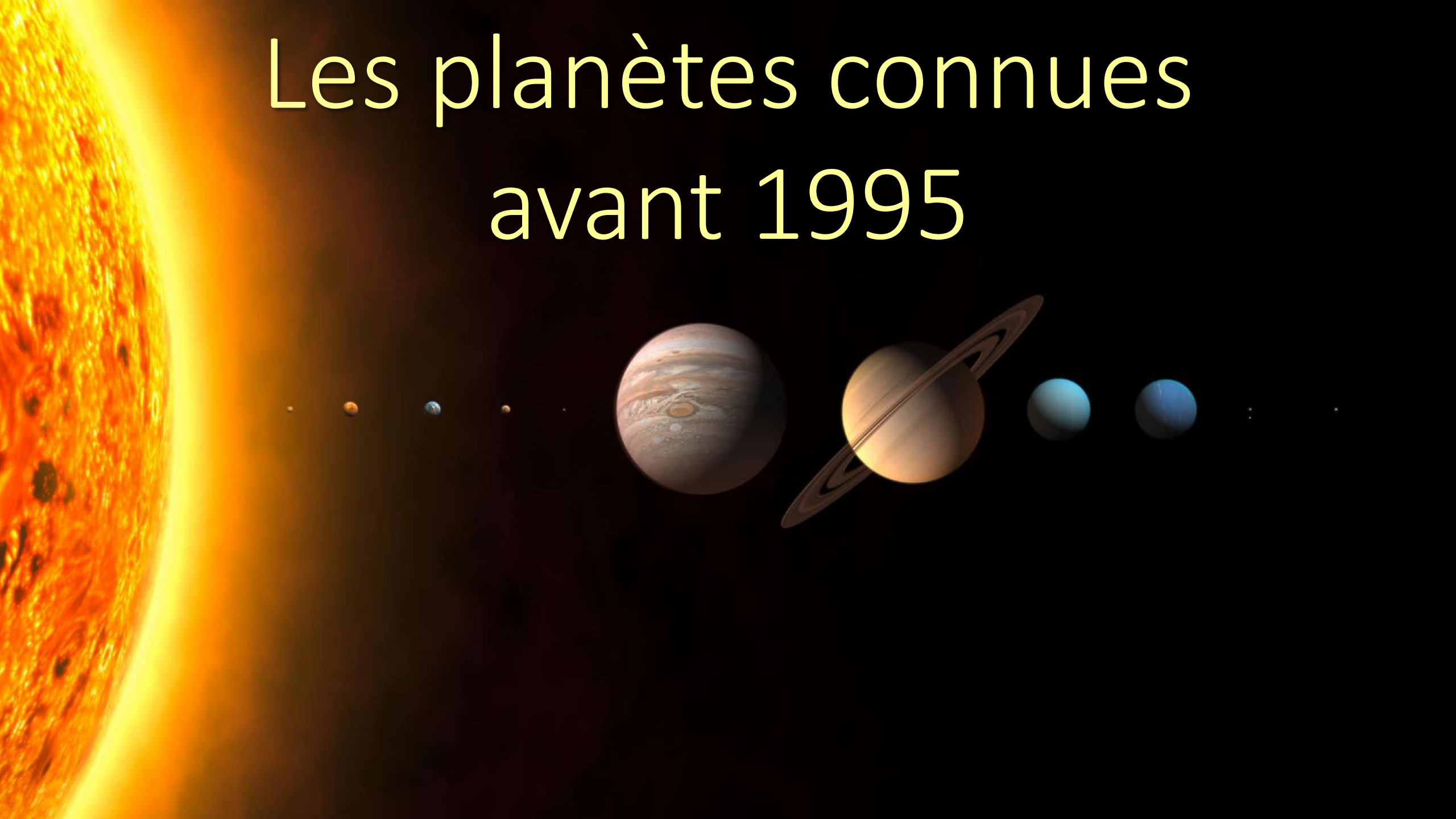
Galileo Galilei, 1610, *Sidereus Nuncius*, Linda Hall Library of Science, Engineering & Technology (Kansas City)



Galileo Galilei, 1613, *Istoria e Dimostrazioni Intorno Alle Macchie Solari e Loro Accidenti* Rome, The Galileo Project – Rice University (Houston)



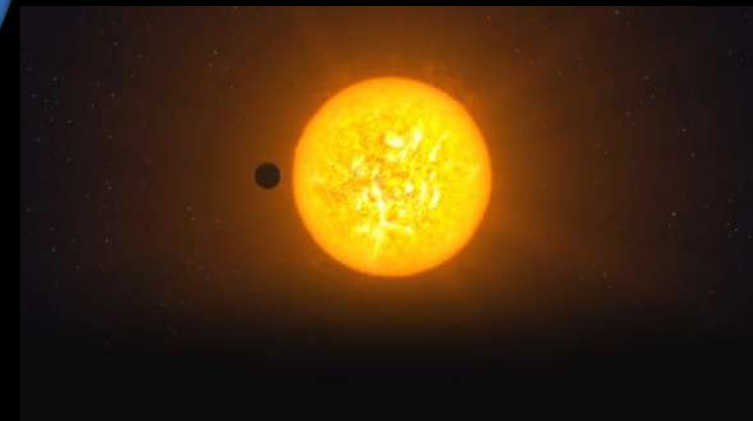
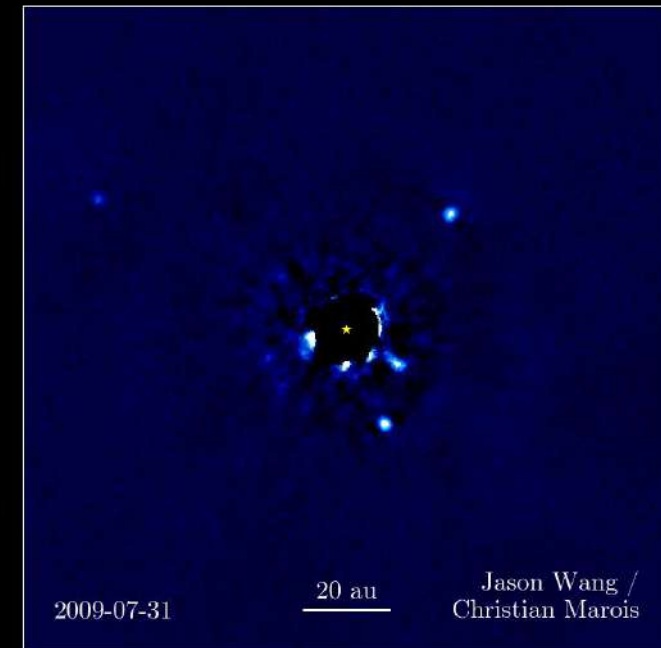
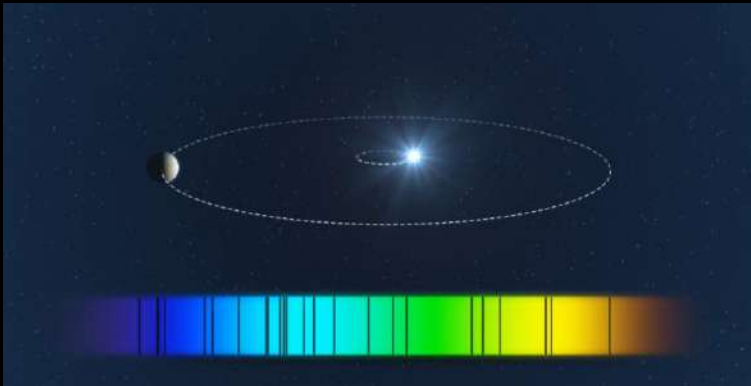
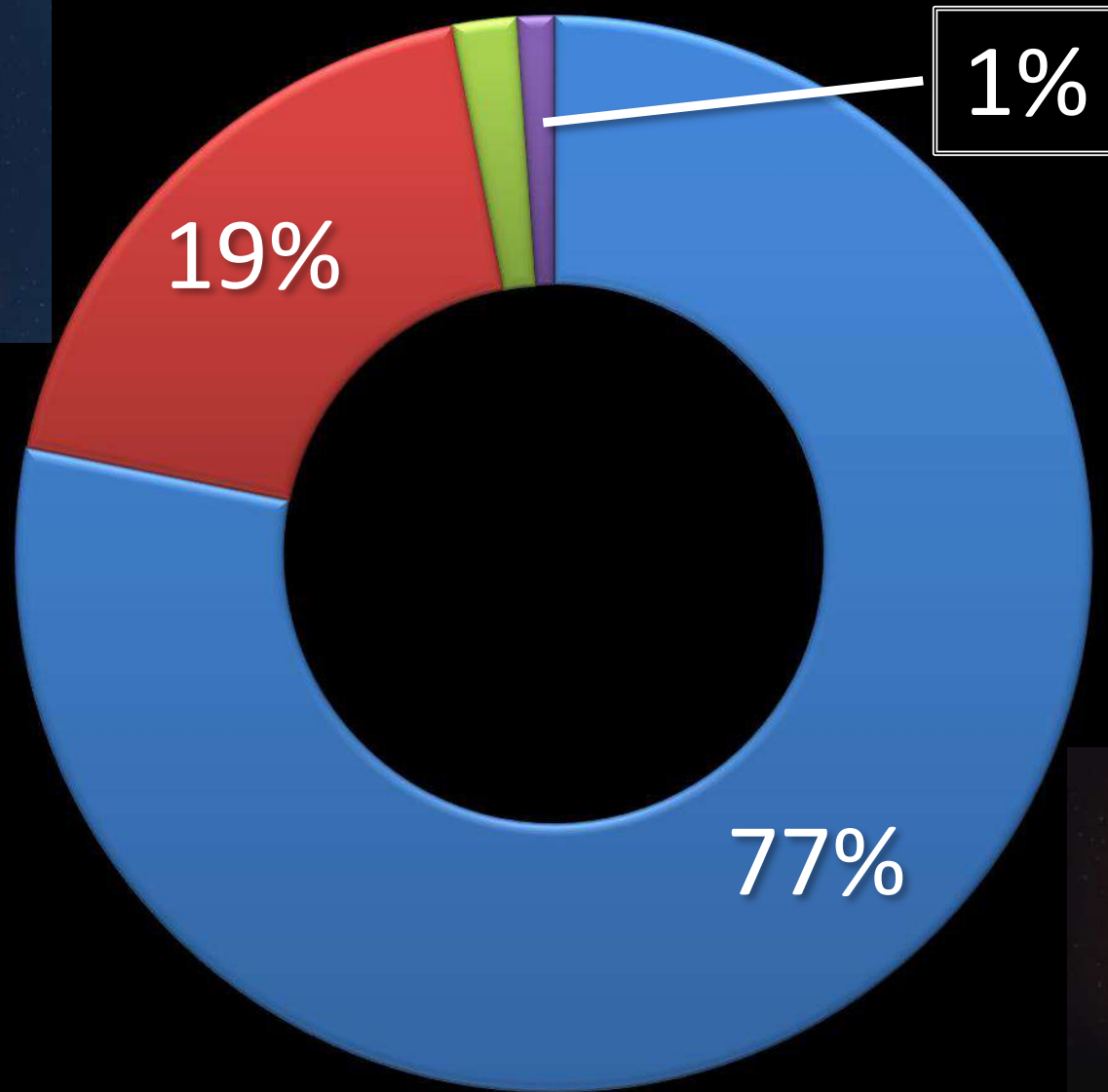
Les planètes connues avant 1995



Comment découvrir des planètes?

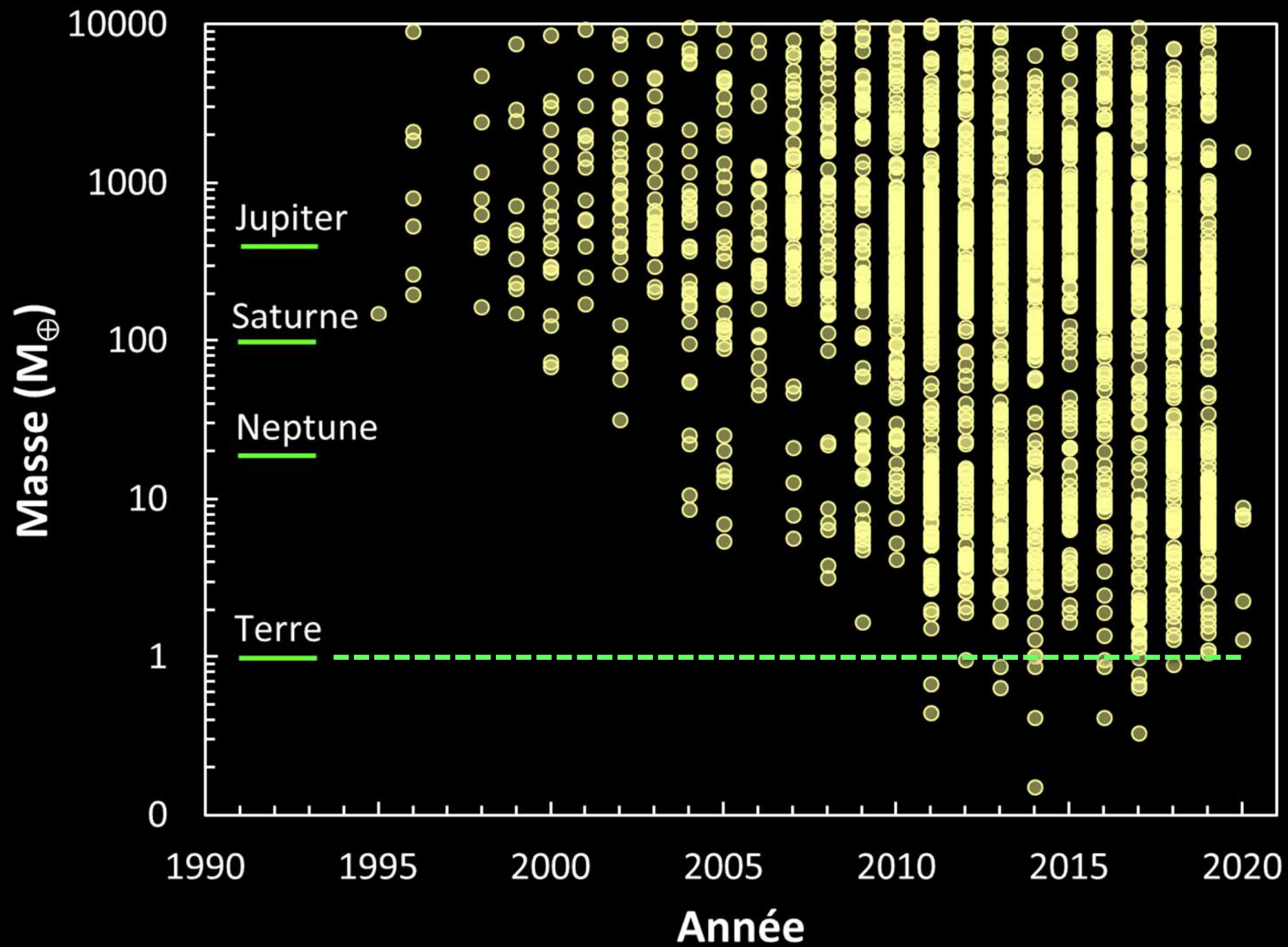


Méthodes de détection

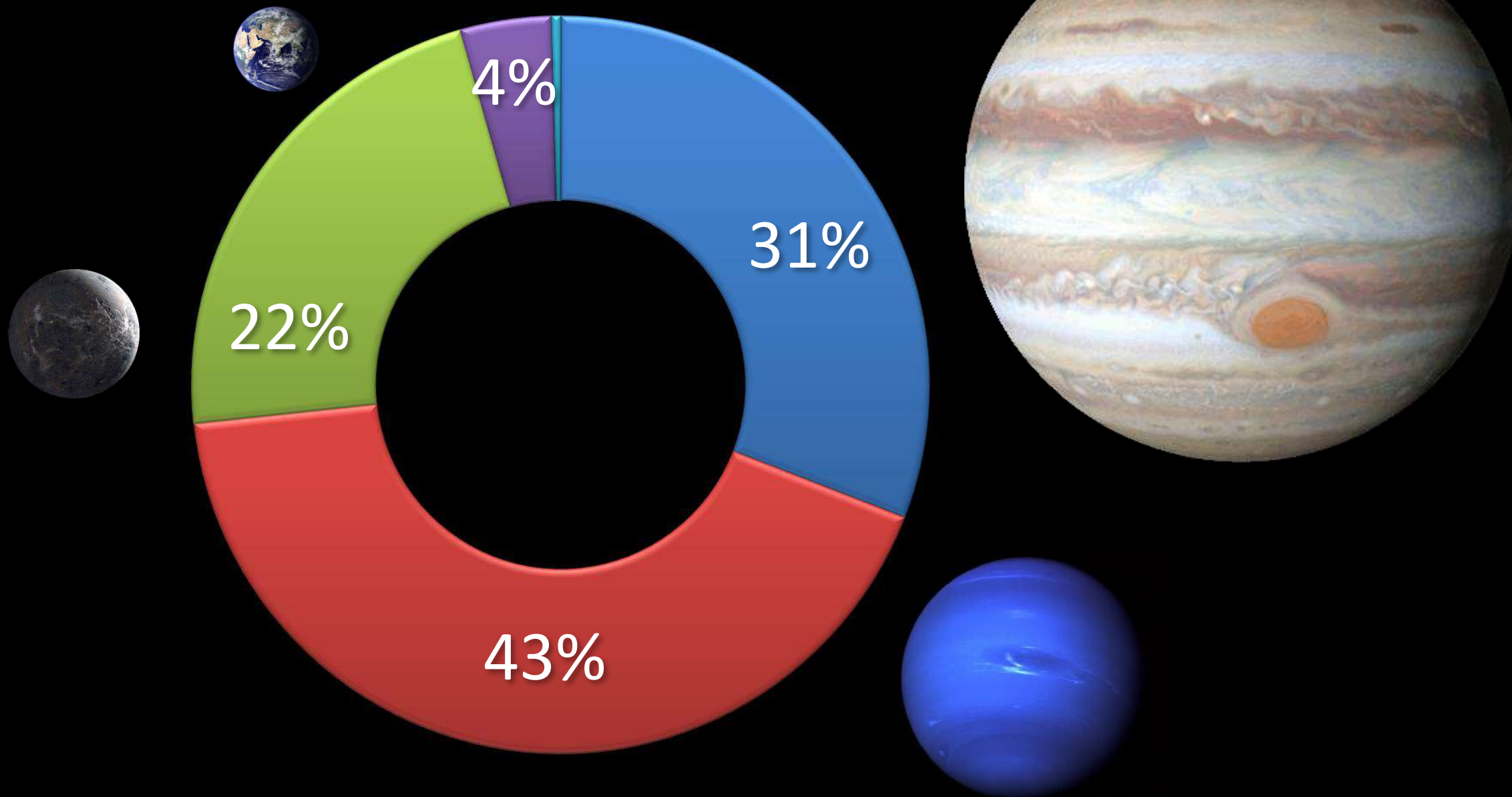


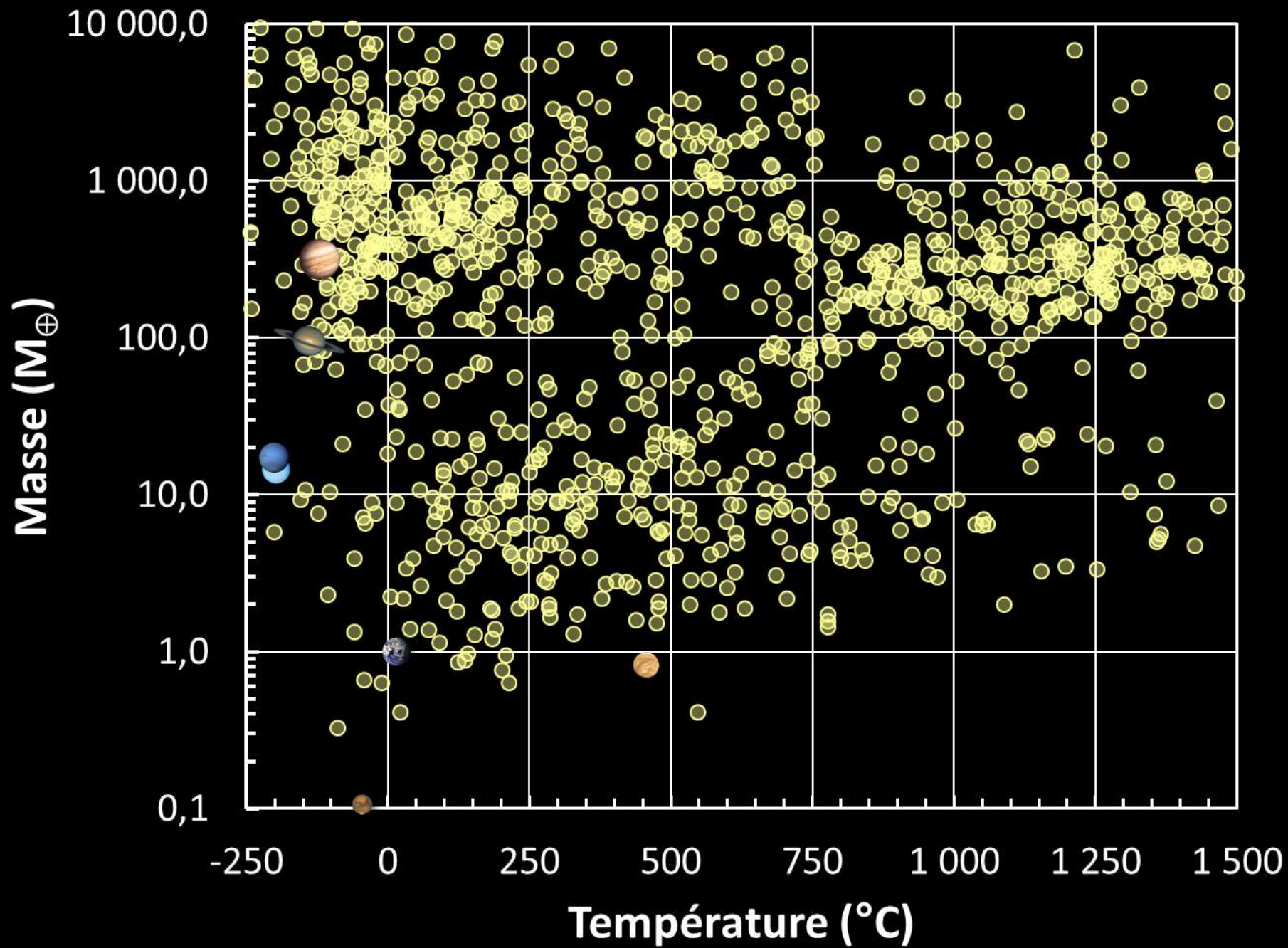
A collage of various Earths and planets in space, with the number 4173 overlaid in yellow. The background features a large, detailed Earth in the upper left, a smaller Earth in the lower left, and a series of smaller Earths and planets in the upper right. The number 4173 is prominently displayed in the center in a bright yellow, sans-serif font.

4173



Types de planètes

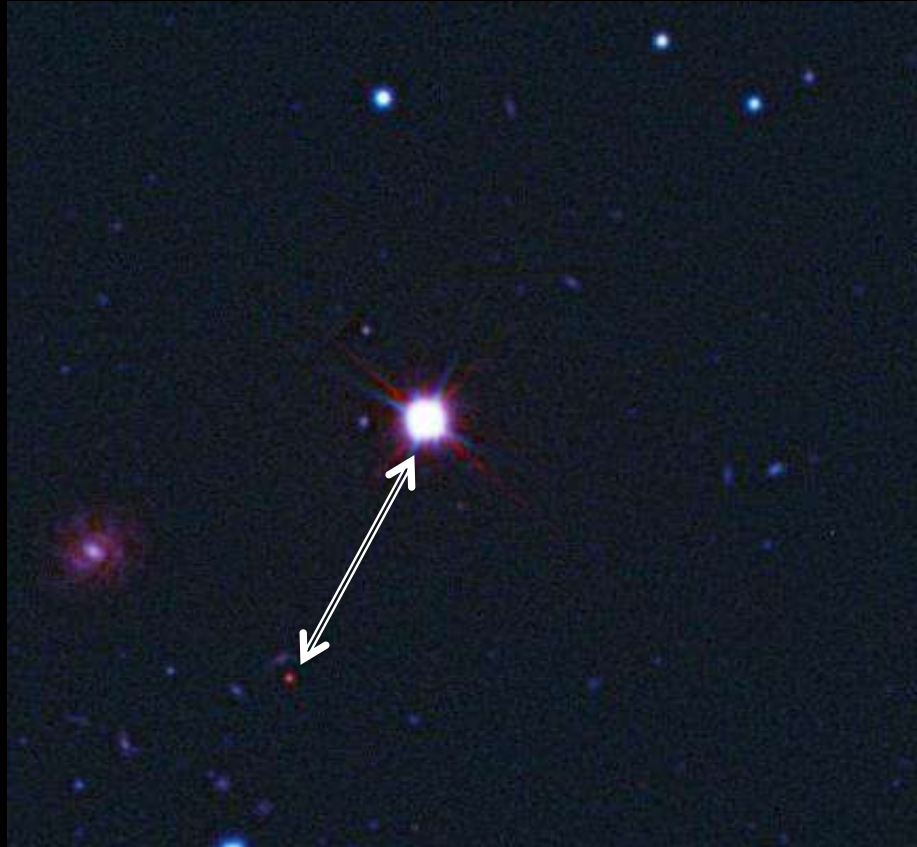






HD 187933b

GU Psc b



Pluton





HD 85512b



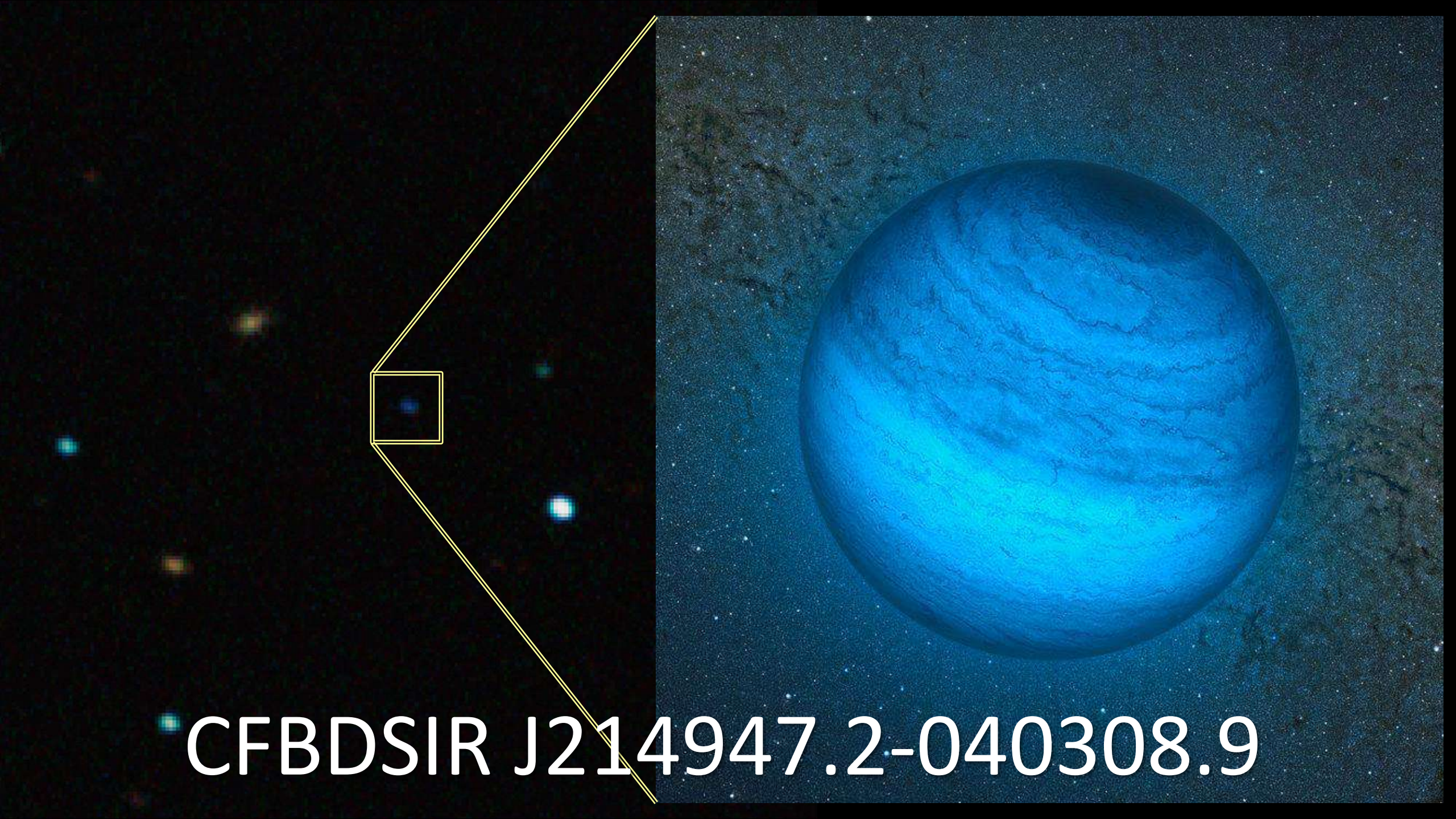
Kepler-62f



Gliese 667(C)c

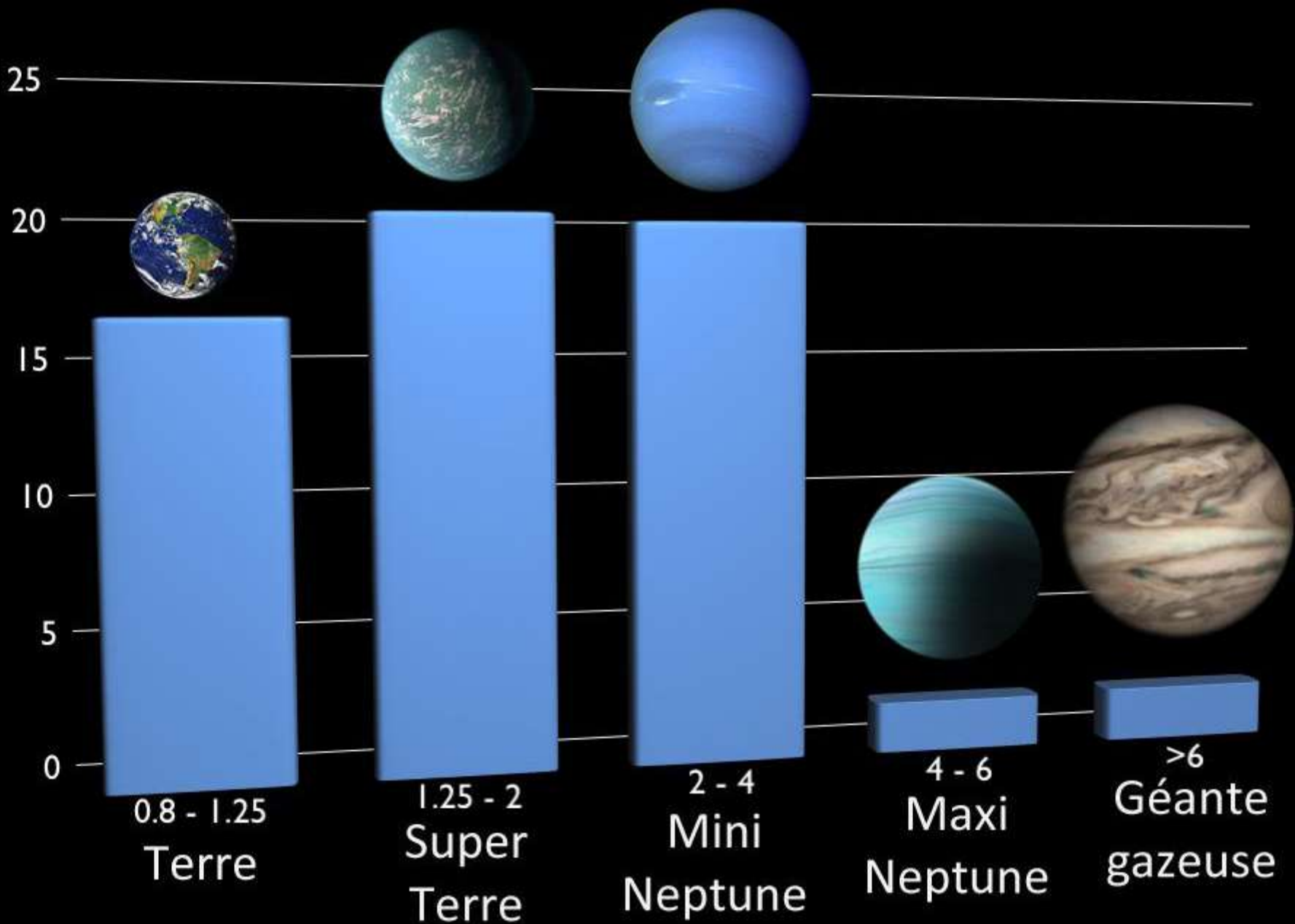


Kepler-70b



CFBDSIR J214947.2-040308.9

Fraction des étoiles
avec au moins une planète



Taille des planètes

$3,83 \pm 0,7$ planètes/étoile avec $P < 3$ ans et $R > 0,2R_{\oplus}$



A series of Earth-like planets, each showing different colors and patterns, are arranged in a line that recedes into the distance against a dark, starry space background. The planets are rendered with a soft, ethereal glow.

Détecter la vie
à distance ?

Planète
rocheuse

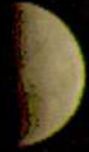


Eau
liquide

Atmosphère

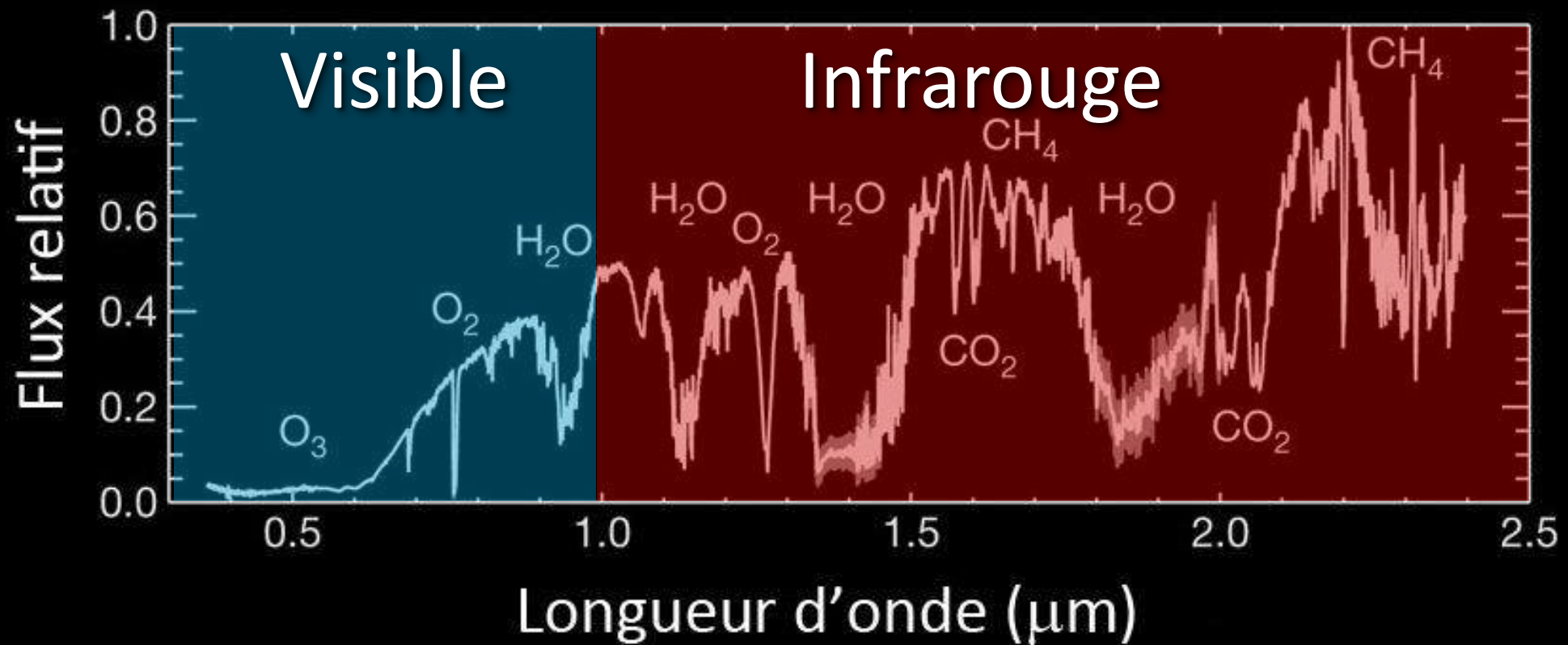


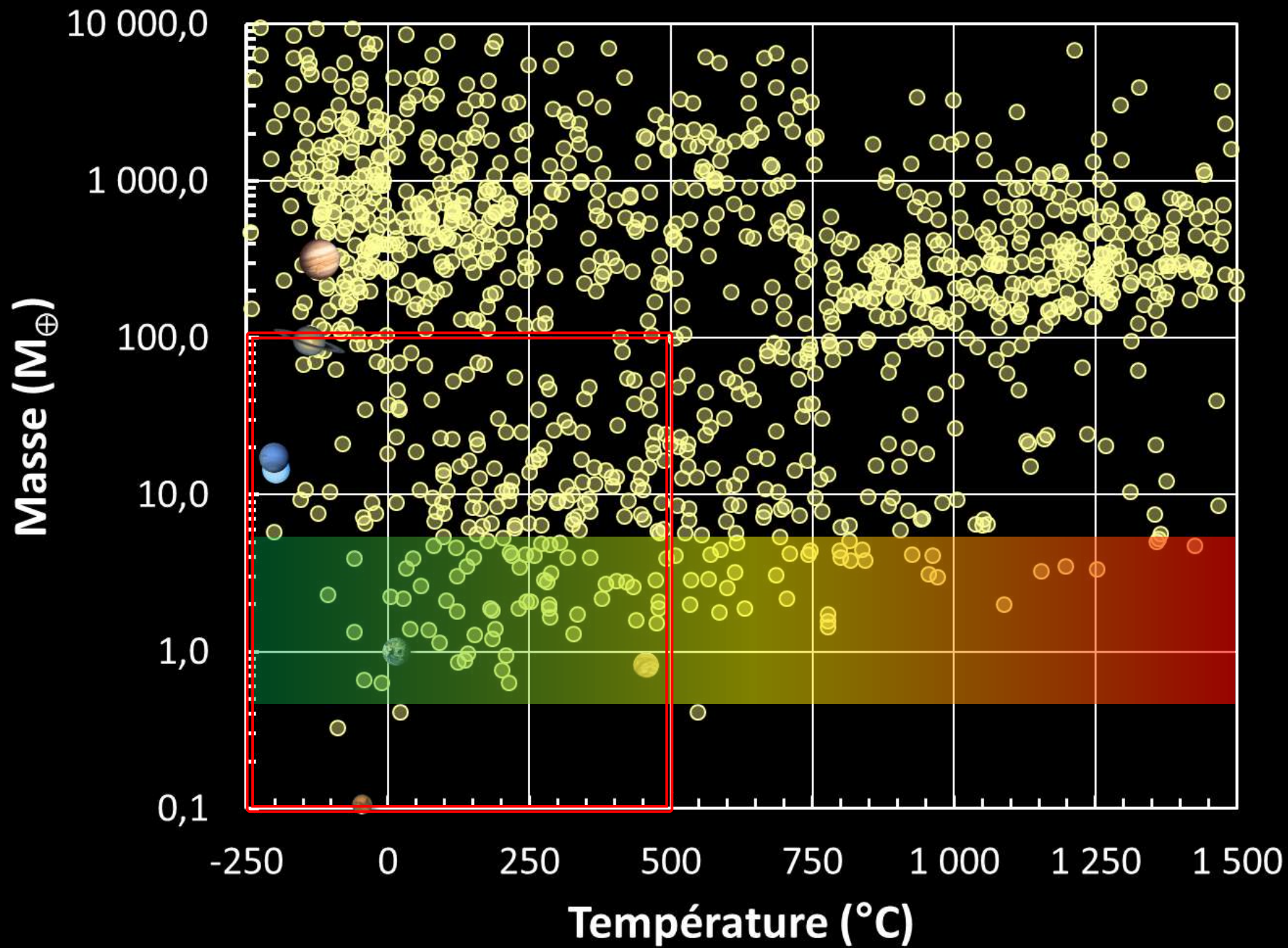
Y a-t-il de la vie sur Terre ?

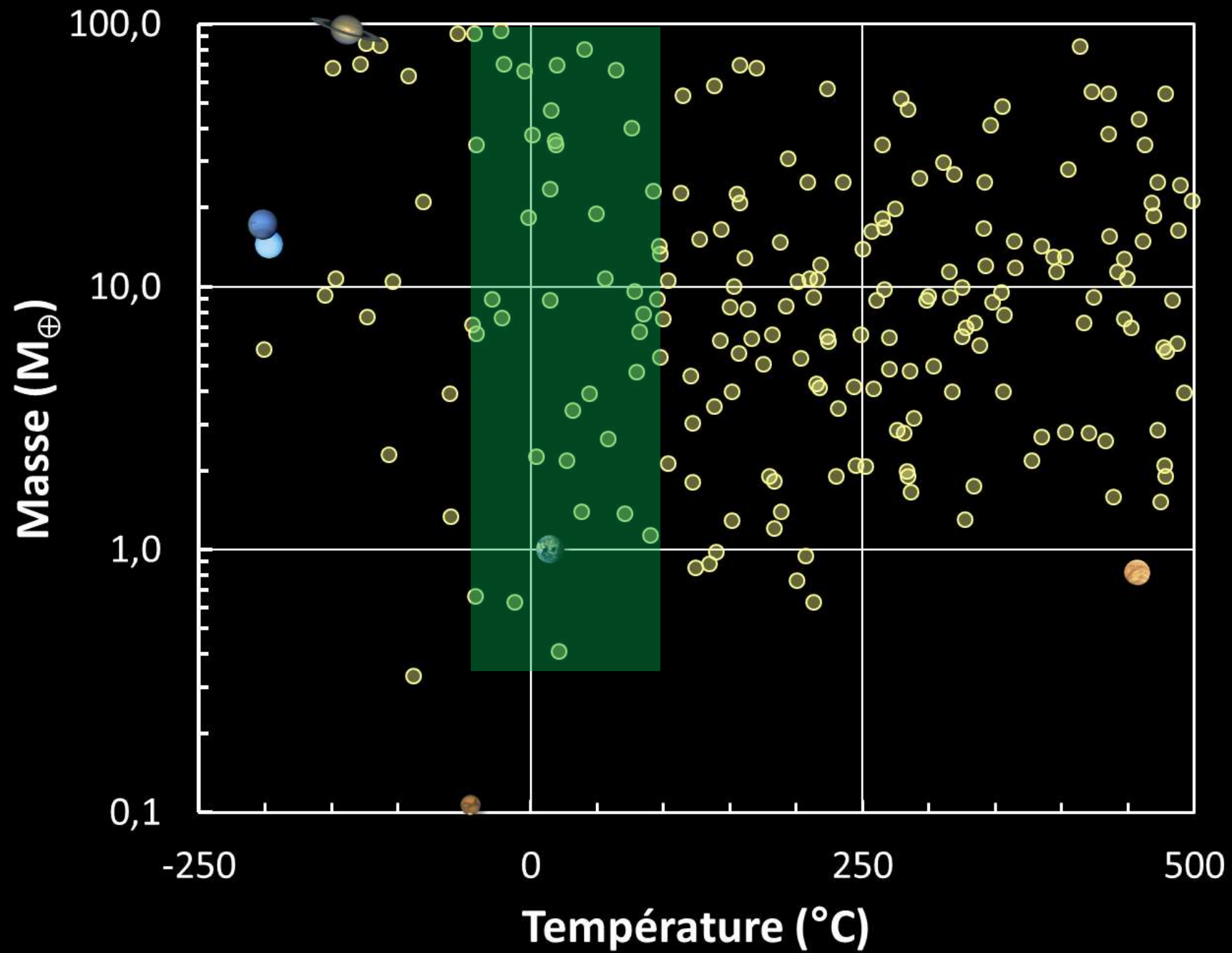


Y a-t-il de la vie sur Terre ?

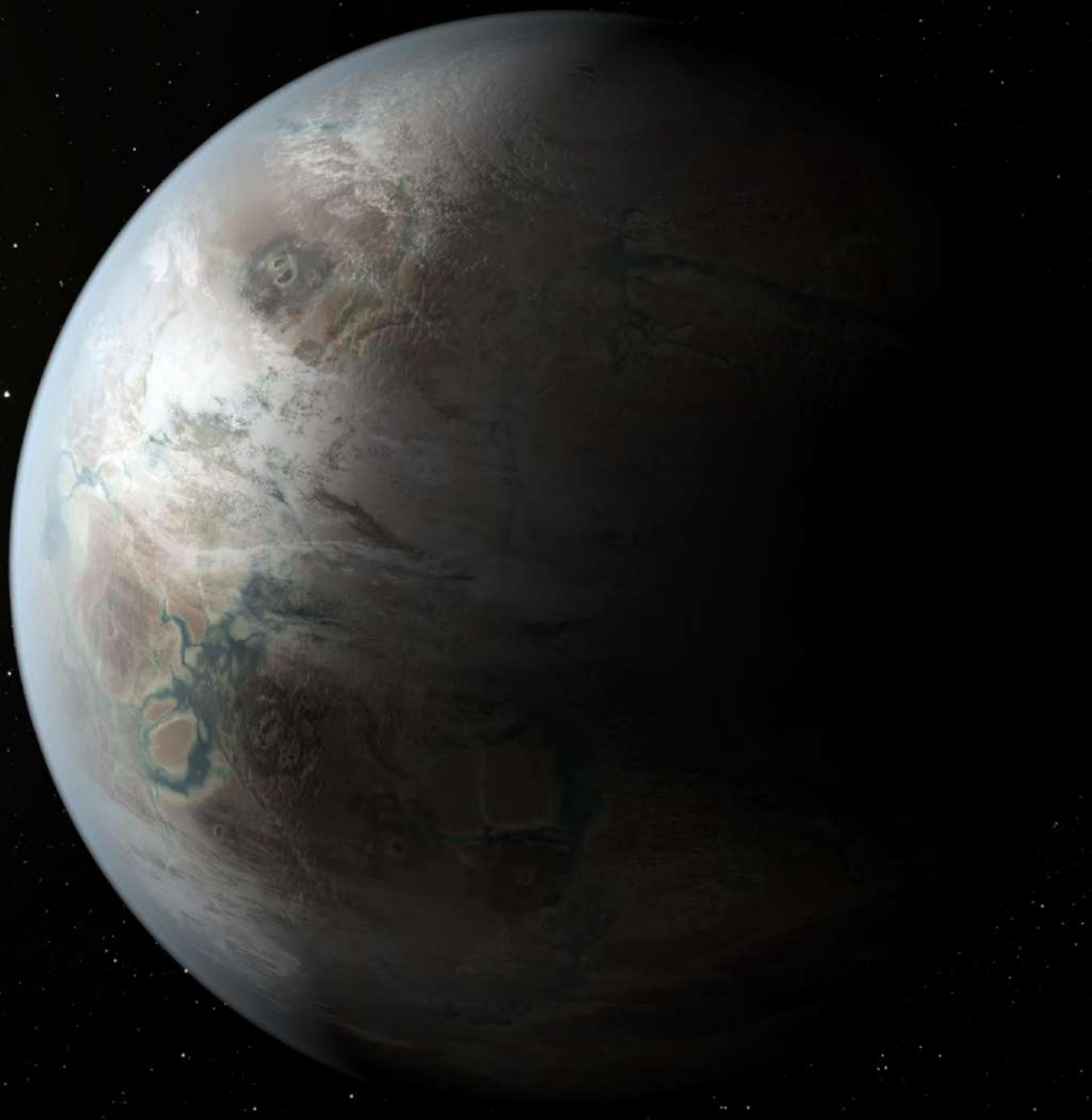


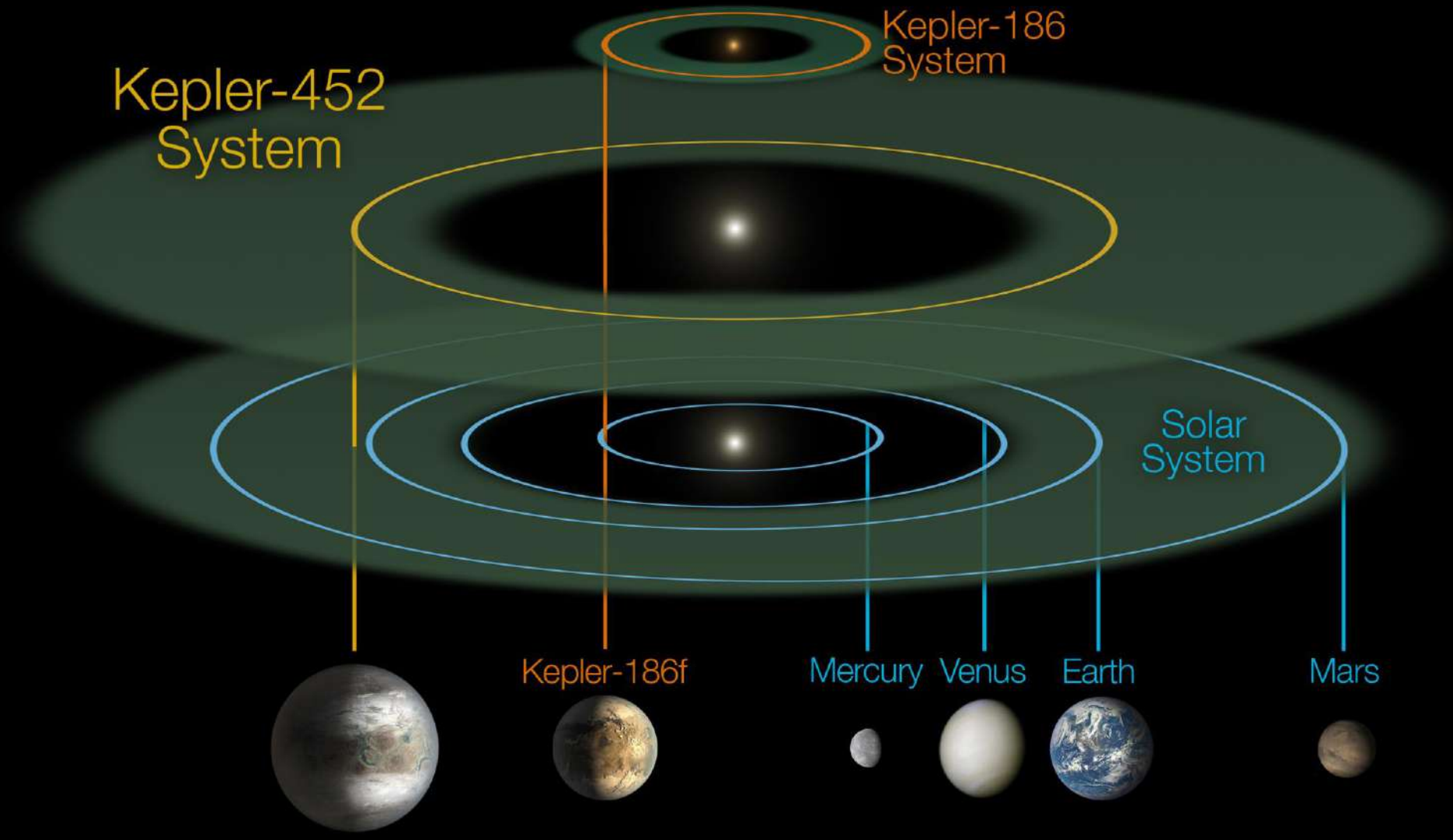






Kepler-452b





Kepler-452
System

Kepler-186
System

Solar
System

Kepler-452b

Kepler-186f

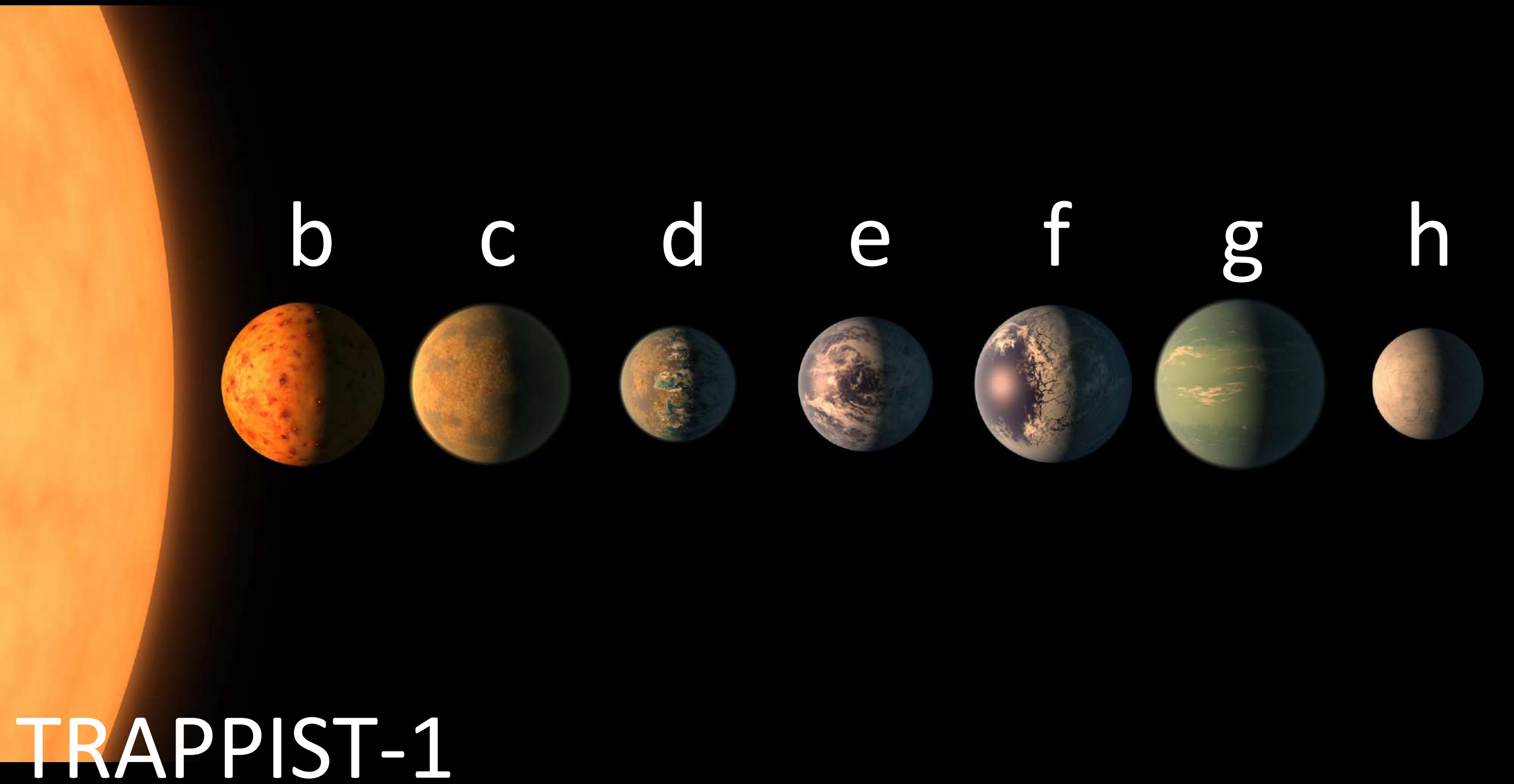
Mercury

Venus

Earth

Mars

ARTISTIC CONCEPT



b

c

d

e

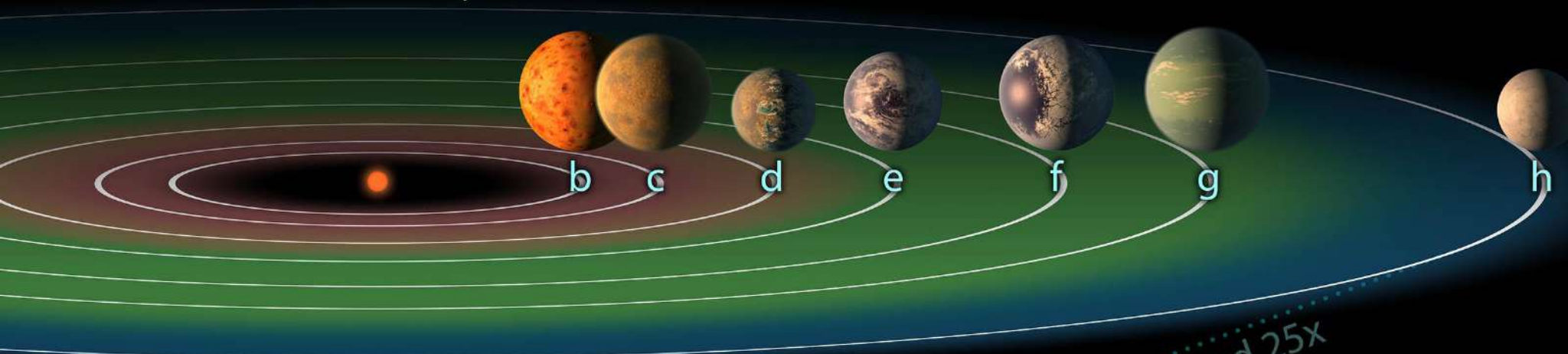
f

g

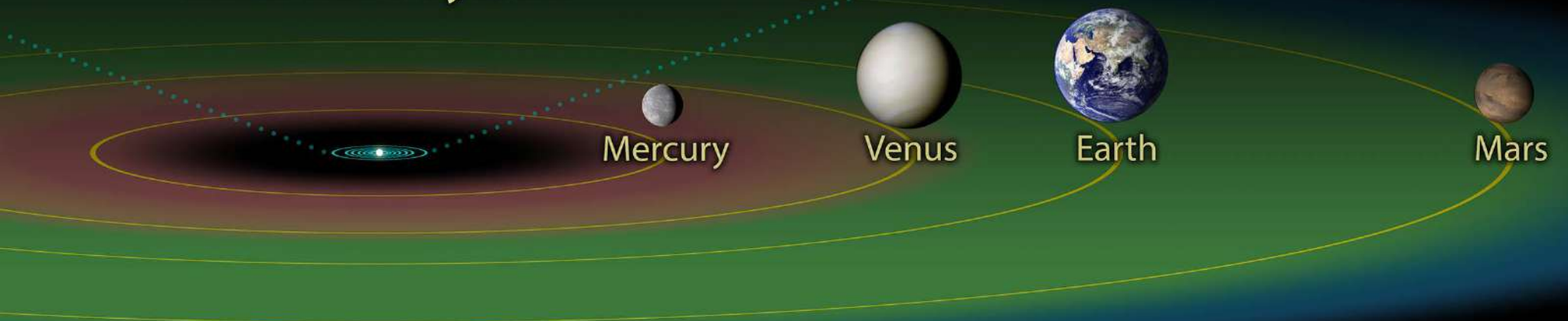
h

TRAPPIST-1

TRAPPIST-1 System



Inner Solar System



Enlarged 25x

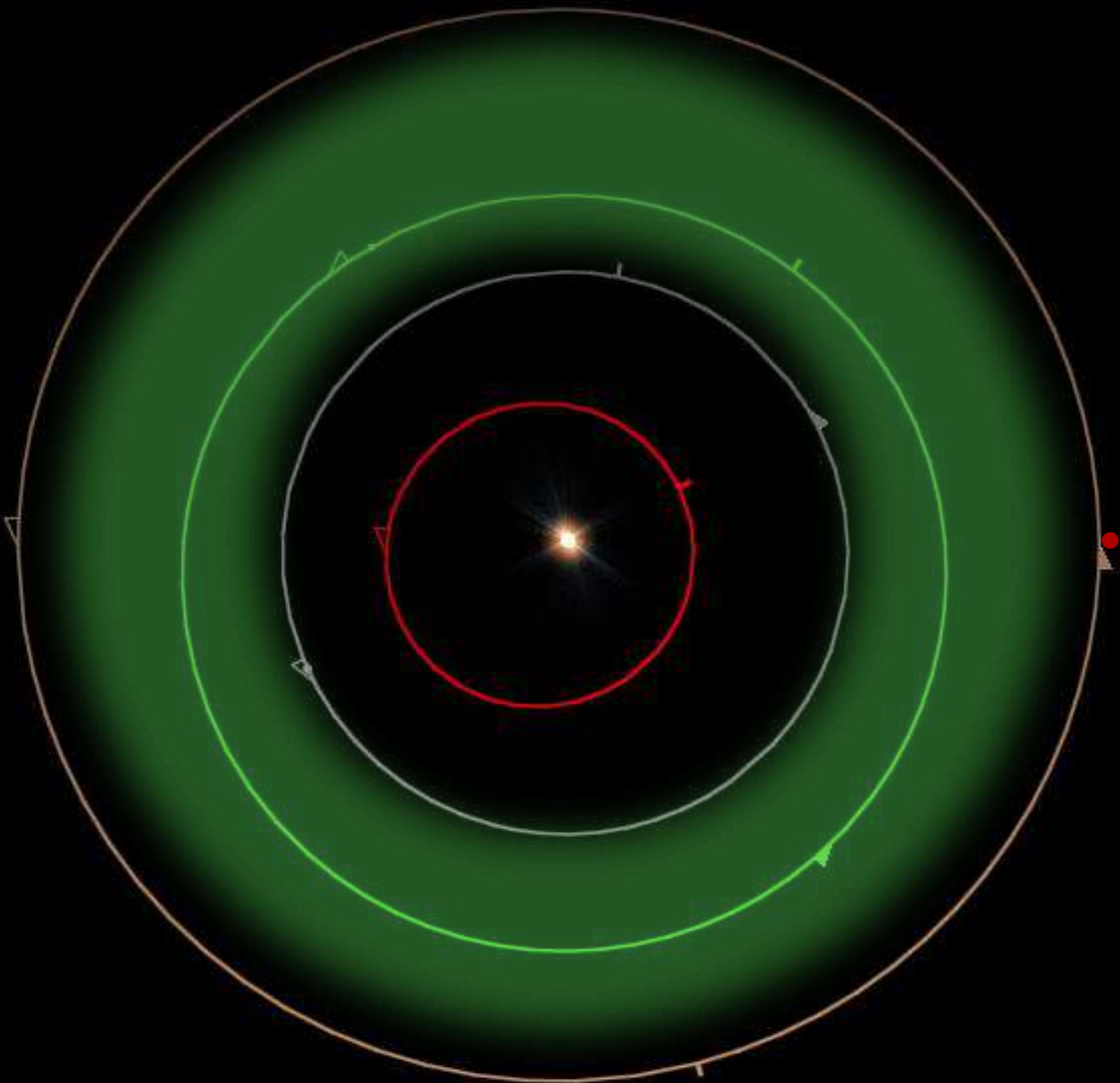
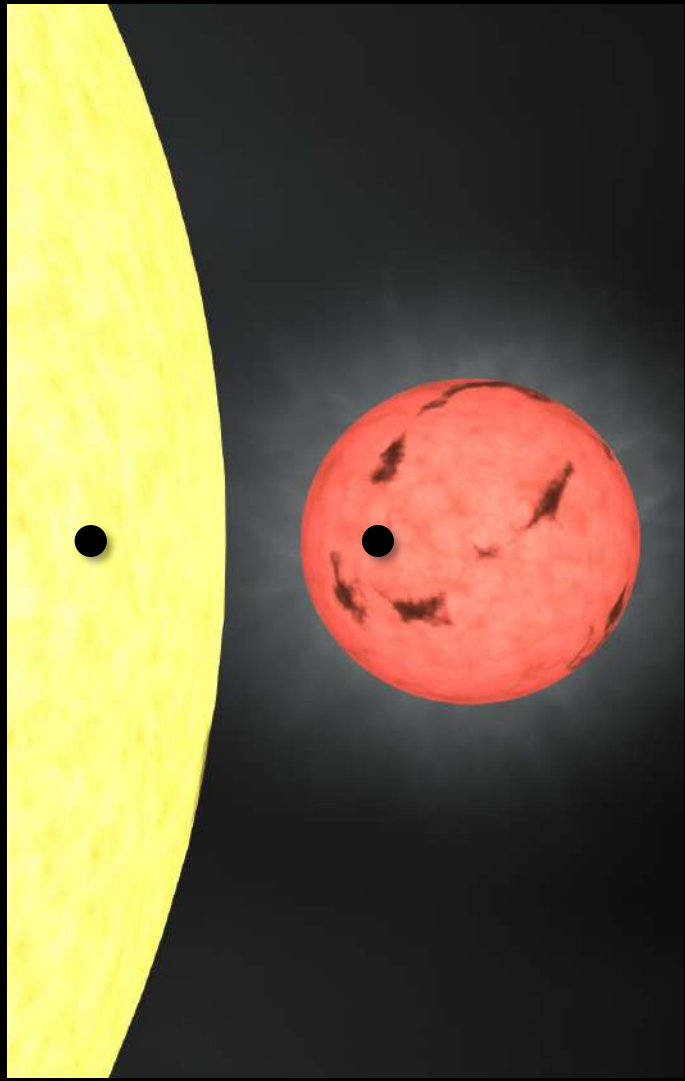
Trappist-1f

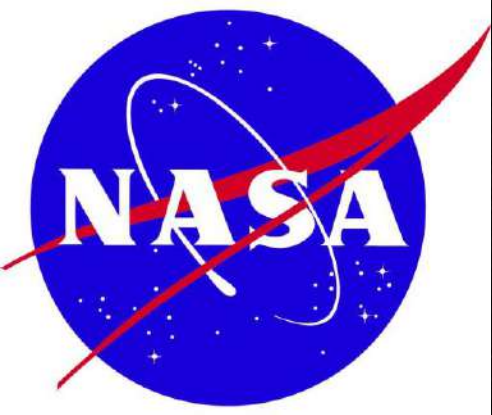


Un raccourci vers la détection de la vie

1. Découvrir des terres et des super-terres en orbite autour d'étoiles de type naine rouge.



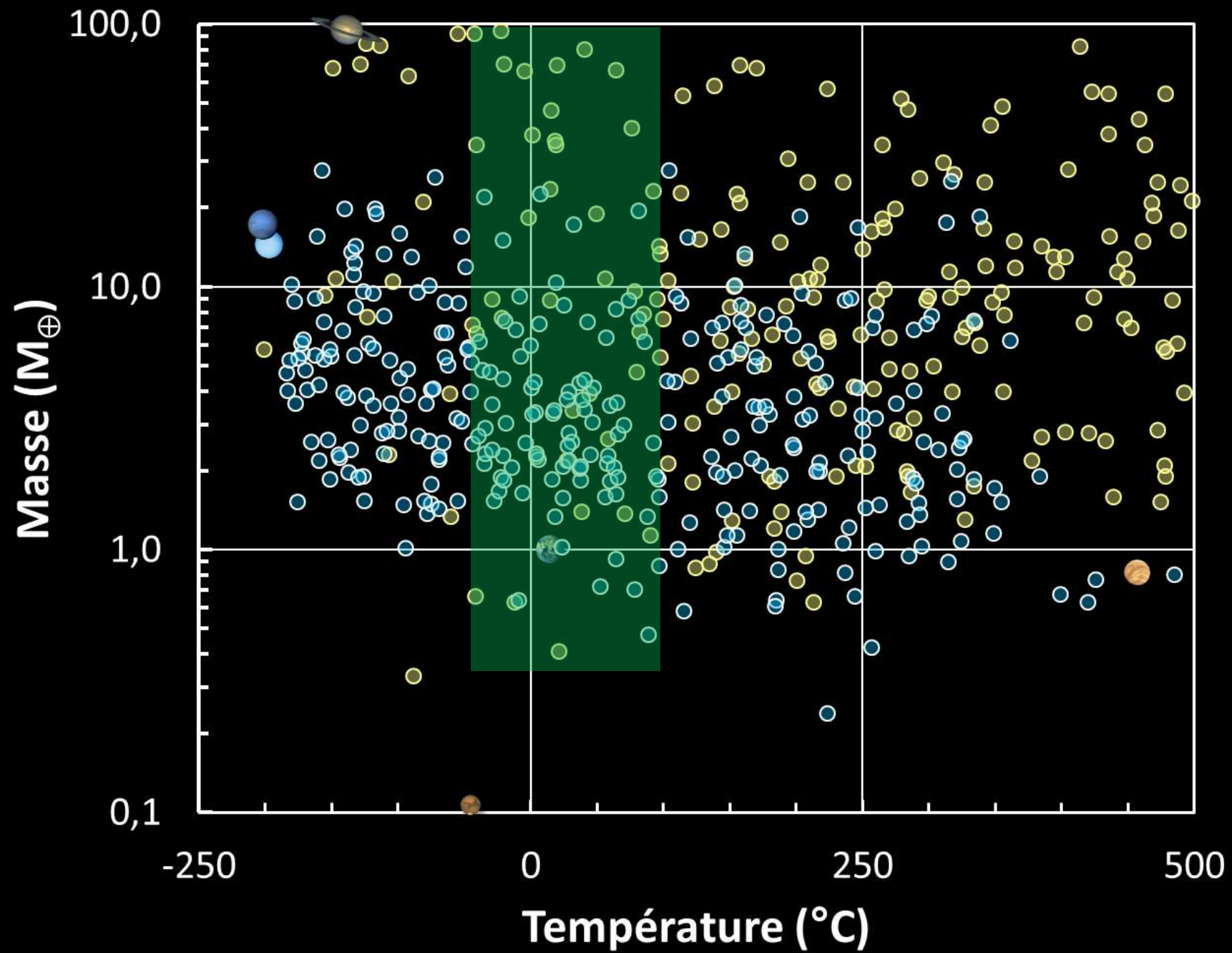





TESS :
2018-2019

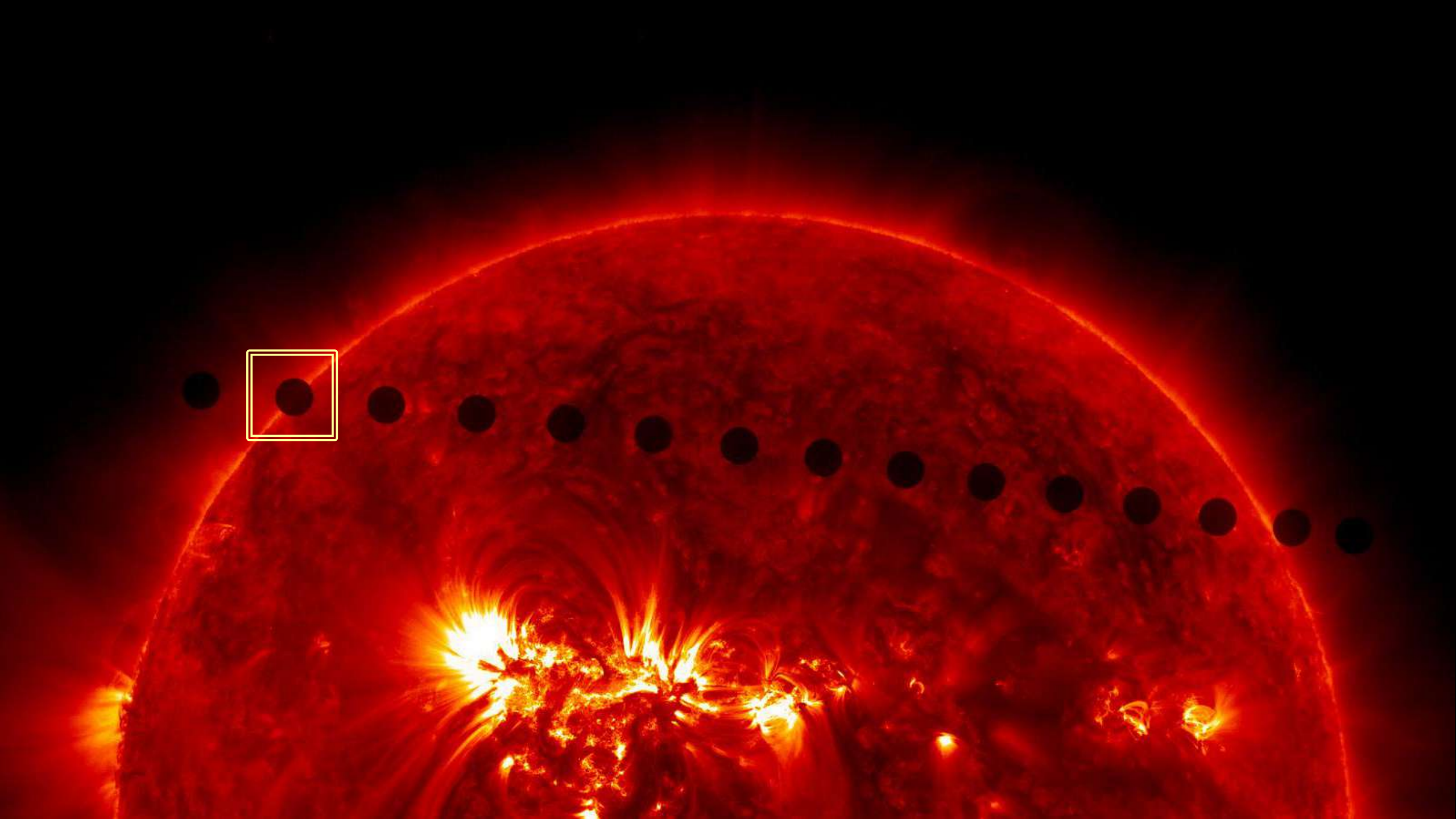
SPiROU : 2018-2022

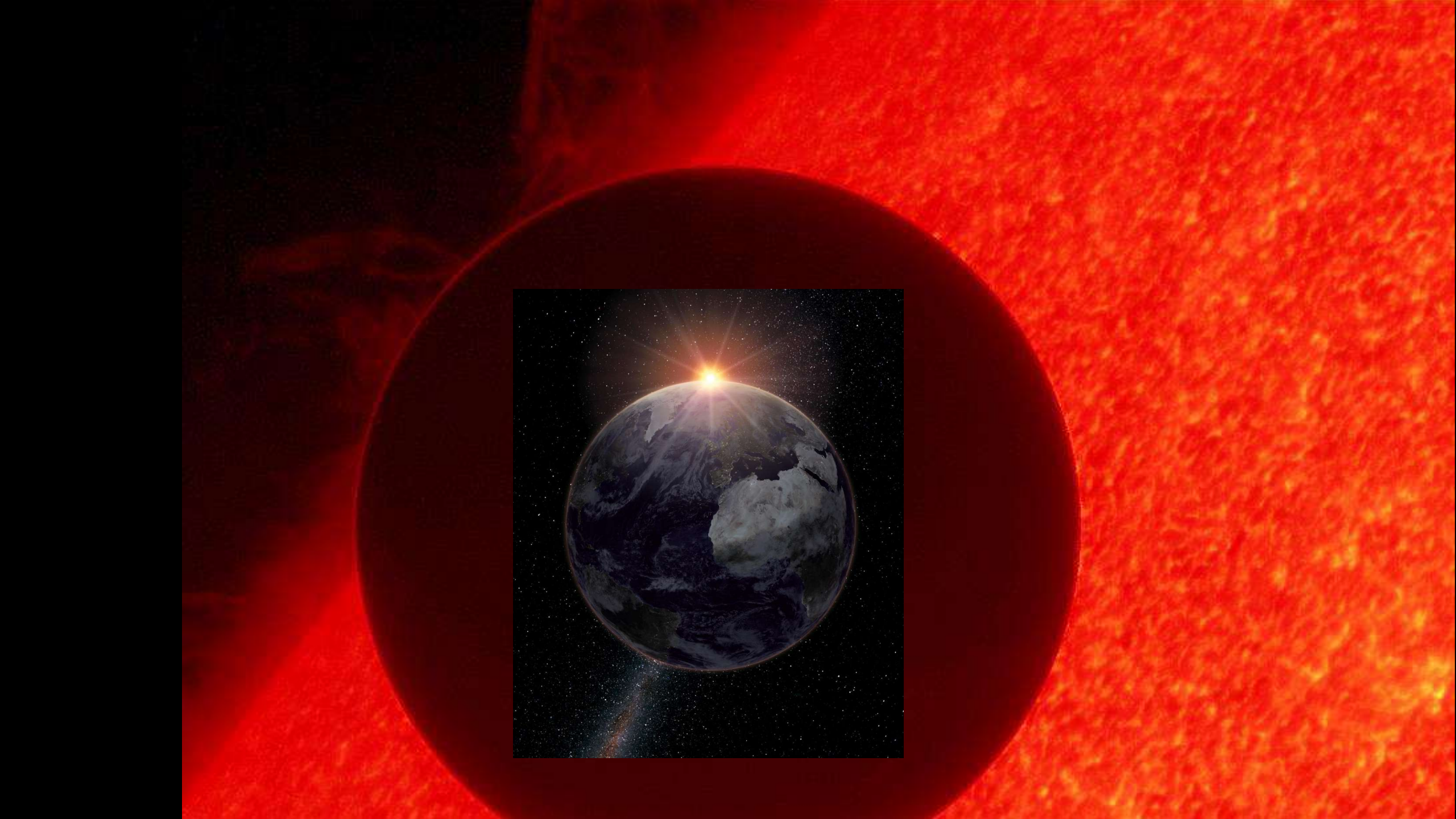




Un raccourci vers la détection de la vie

- 
- A red dwarf star is shown in the upper left, with a small planet in the background. In the foreground, a larger planet is visible, showing a reddish-brown surface with some darker spots. The background is black.
1. Découvrir des terres et des super-terres en orbite autour d'étoiles de type naine rouge.
 2. Détecter la présence d'une atmosphère et déterminer sa composition chimique.

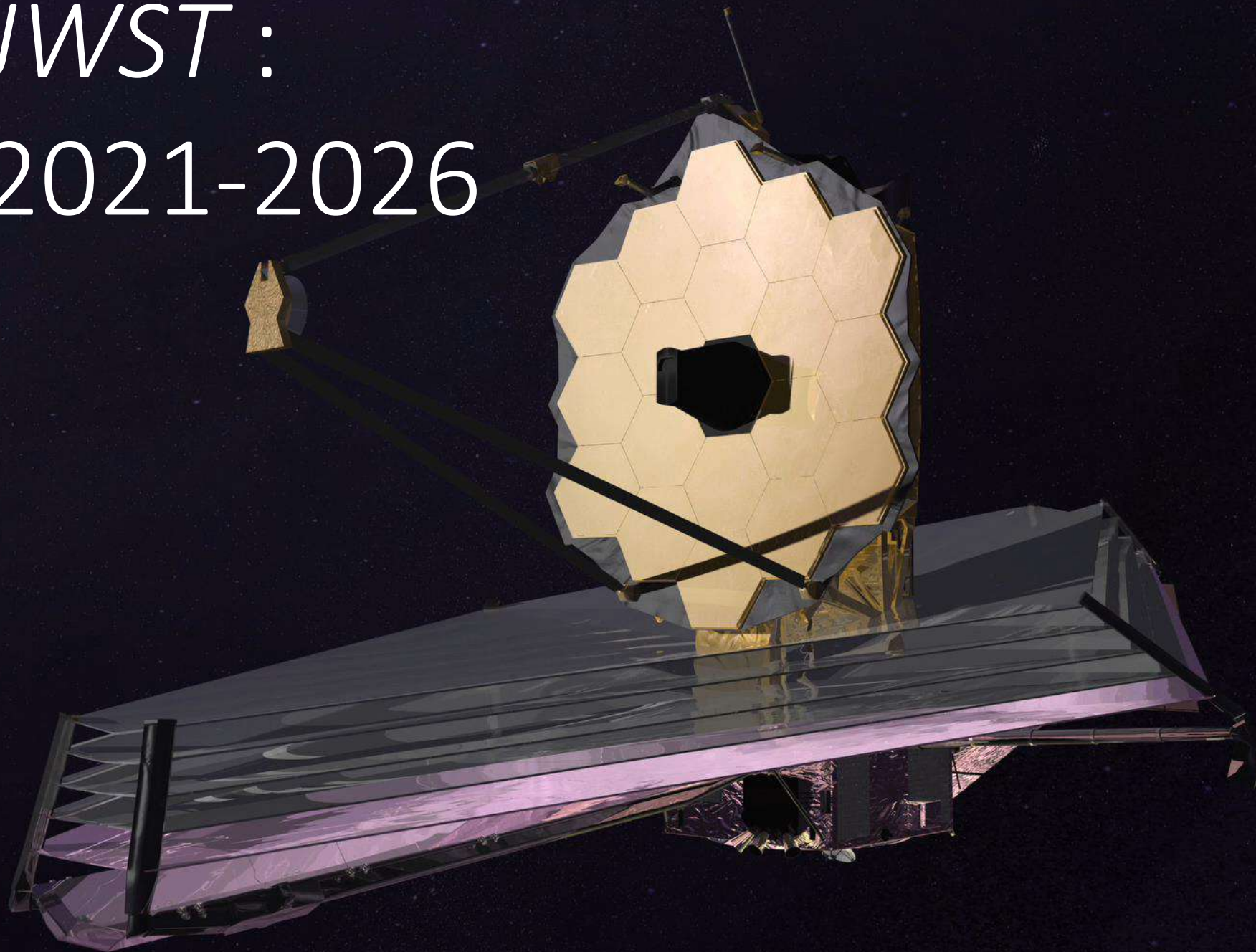






TMT : 2026

JWST :
2021-2026





Printemps 2021



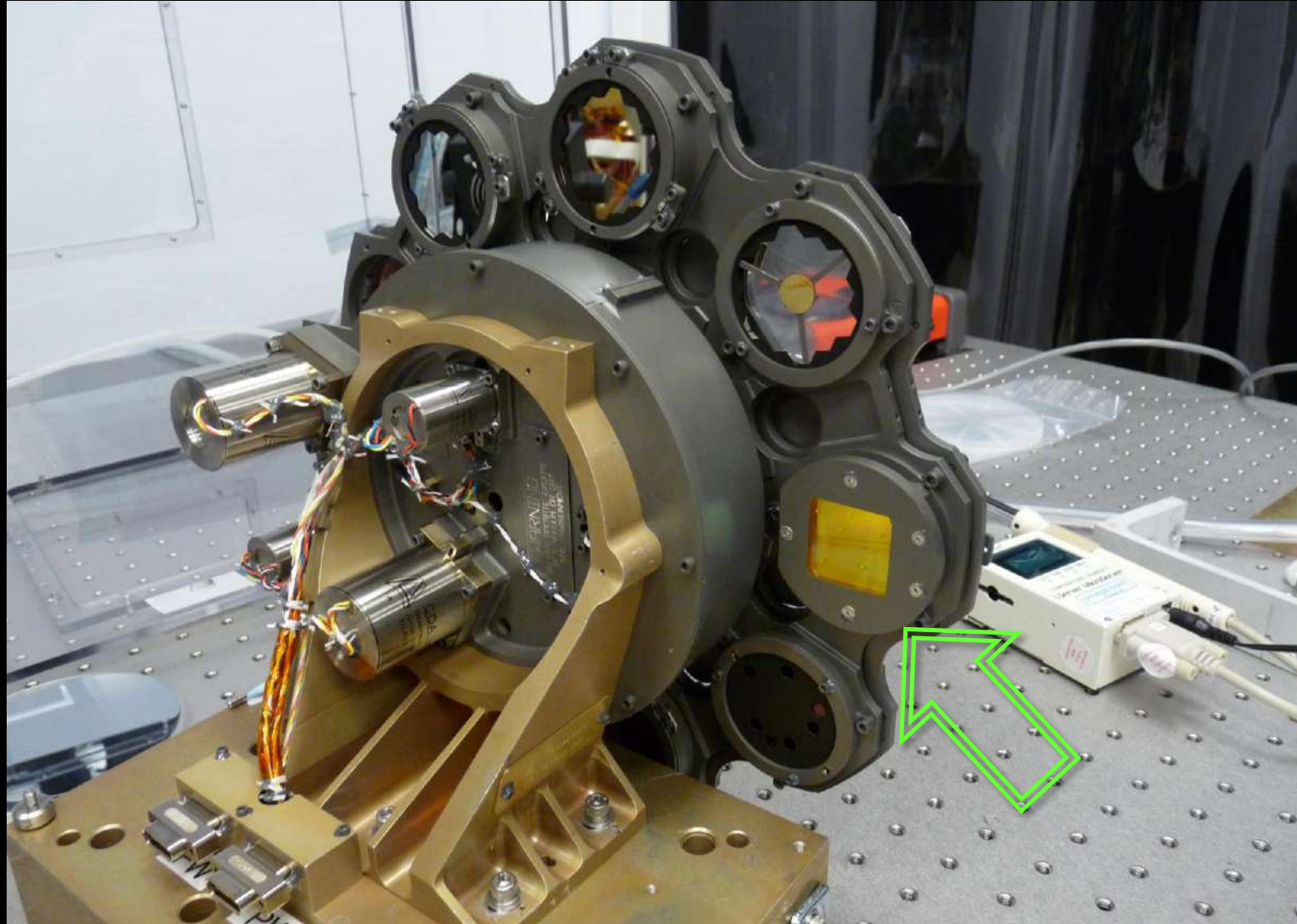
Quatre instruments scientifiques ...

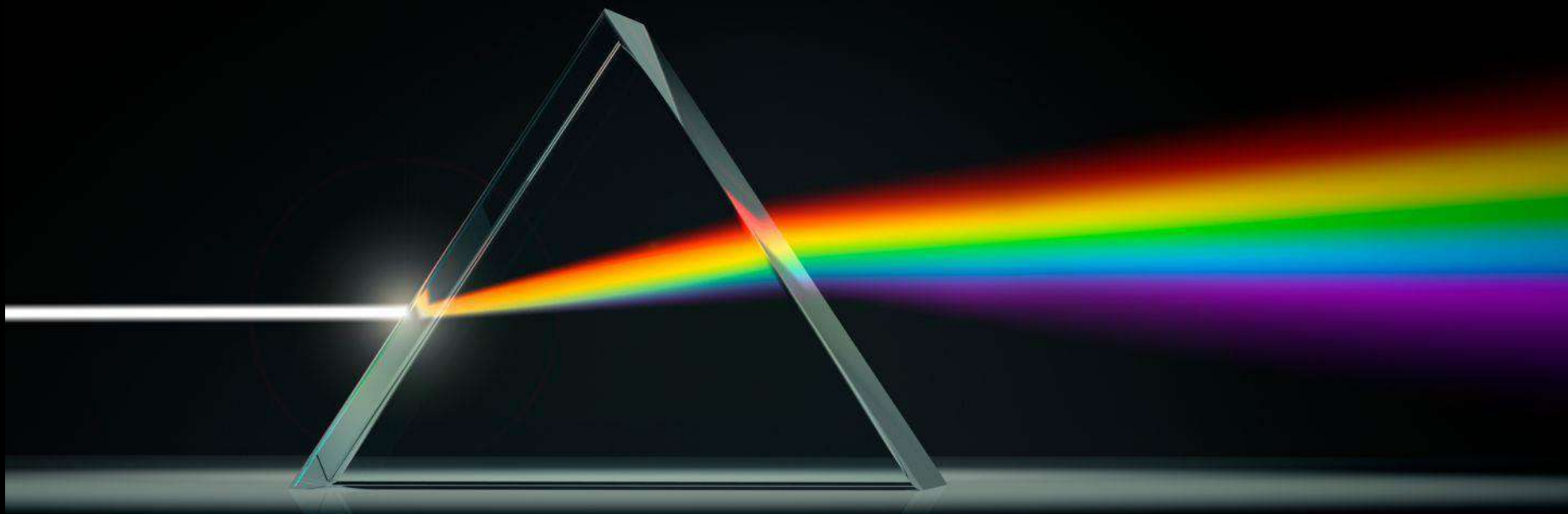


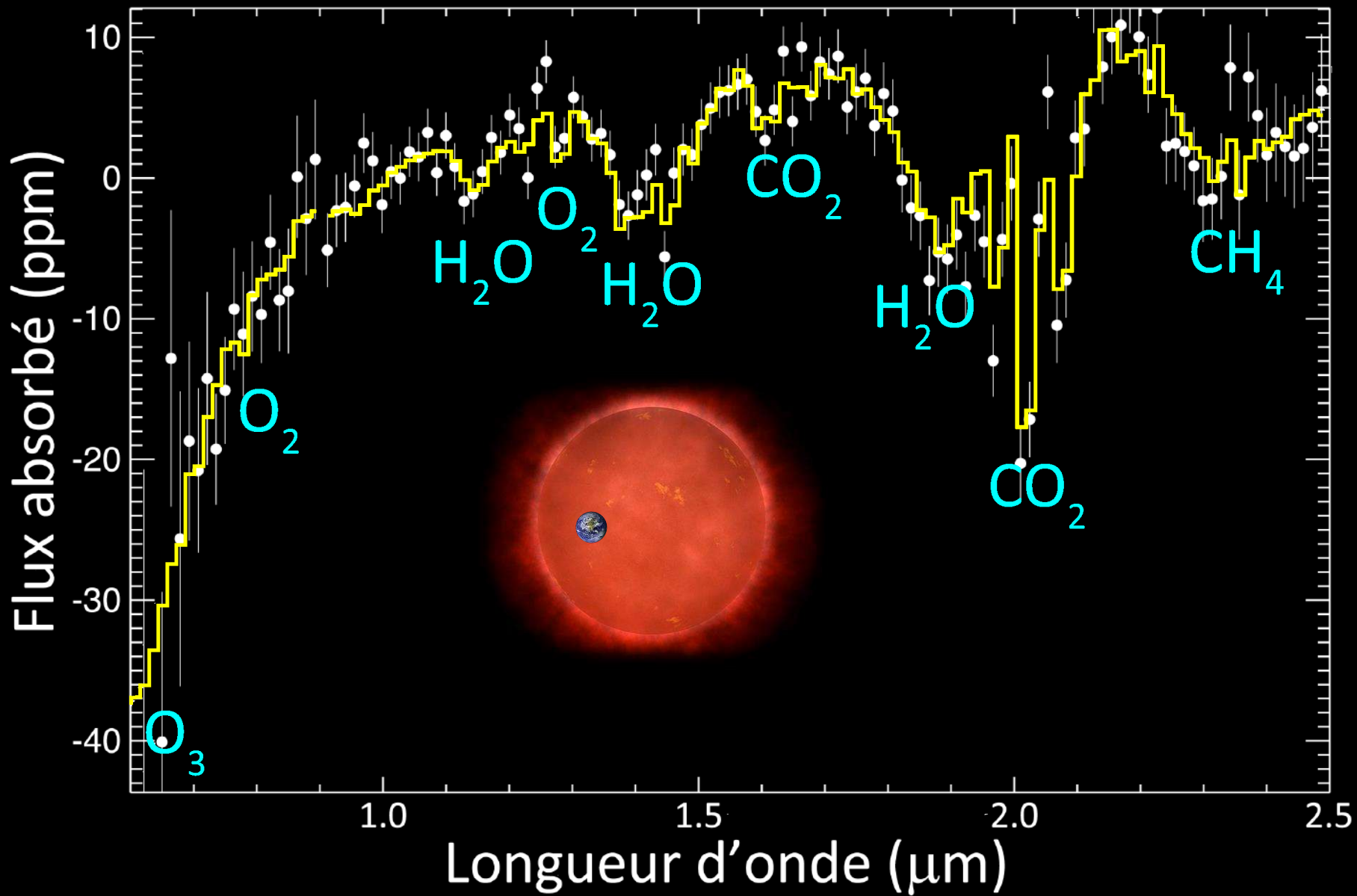
... dont un instrument canadien ...



... conçu pour détecter l'atmosphère
d'exoplanètes.







Objectif

Découvrir la vie à l'extérieur du système solaire



Merci !

www.astro.umontreal.ca/~lamont/UTA/Vie_ESS_UTA_2020.pdf