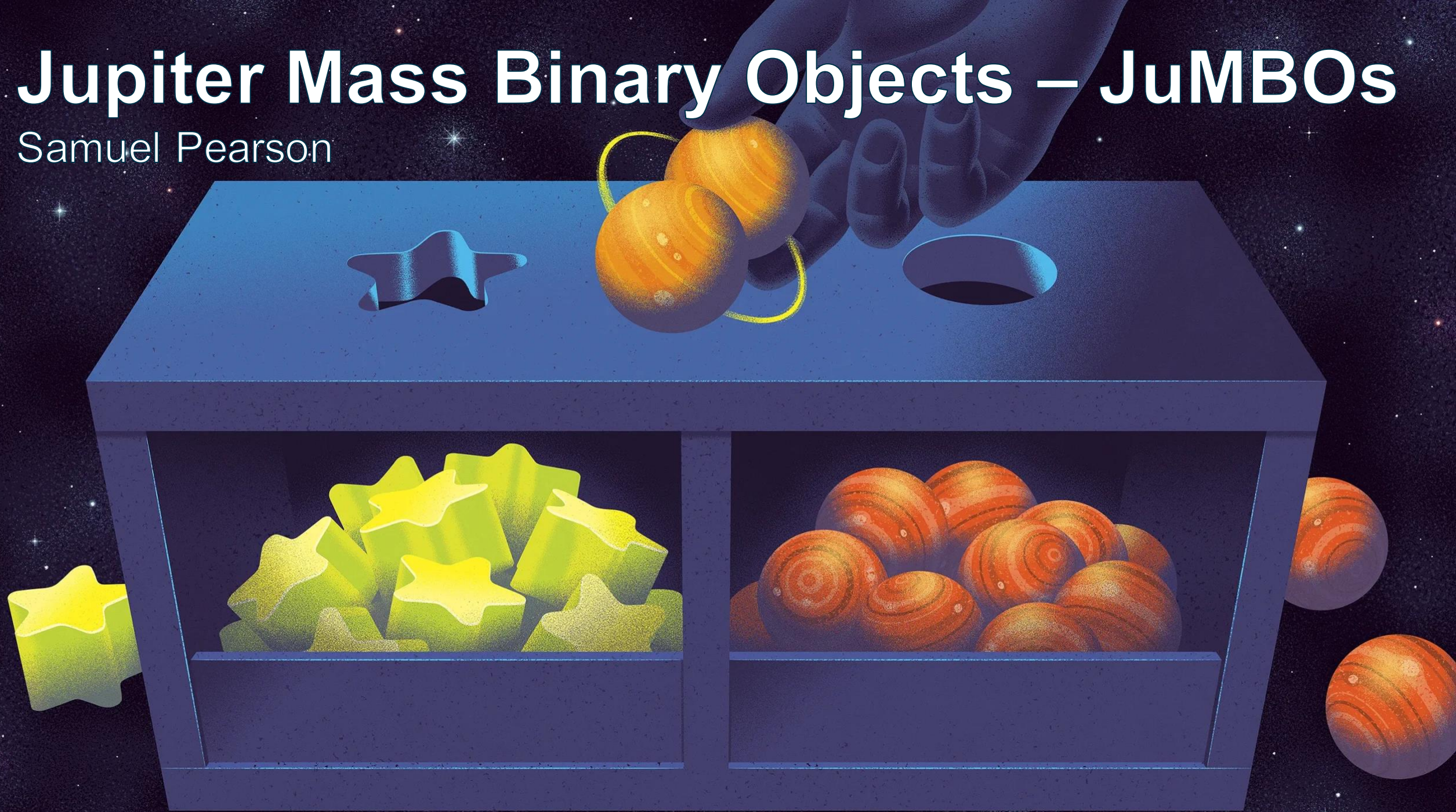


Jupiter Mass Binary Objects – JuMBOs

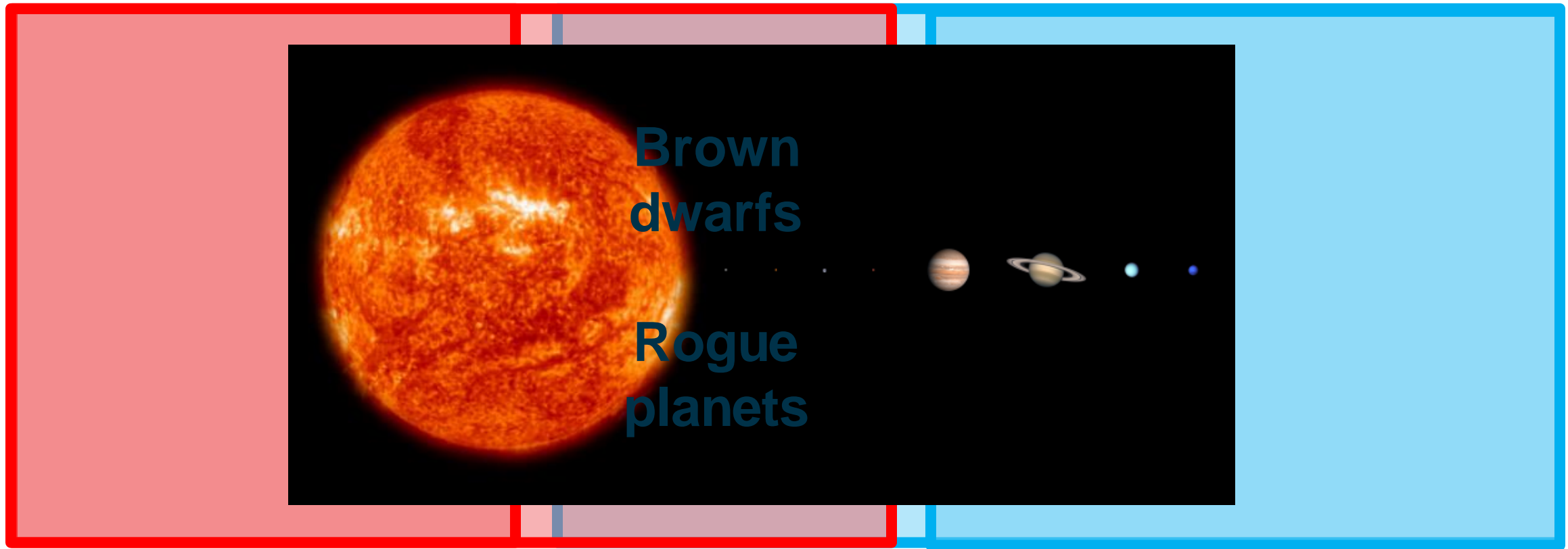
Samuel Pearson



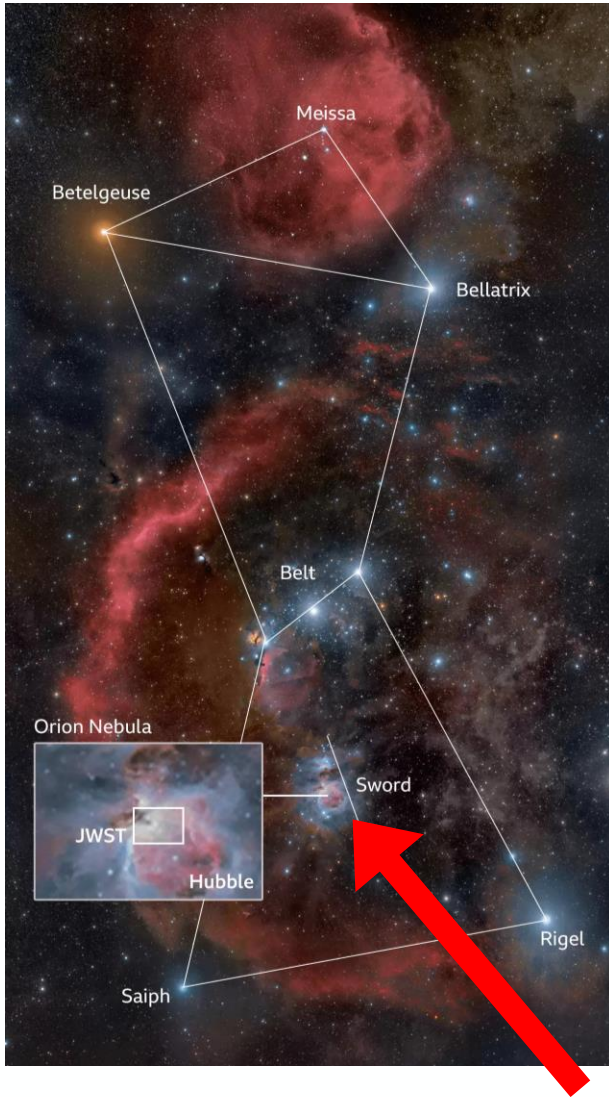
Planetary Mass Objects

Stars

Planets



The Trapezium Cluster



Young: ~1 Million years old

Close: 390 ± 2 pc

Massive: 2000+ cluster members





NIRCam data reduction

- Saturation
- WCS registration
- Source detection
- Image alignment
- Large mosaic processing

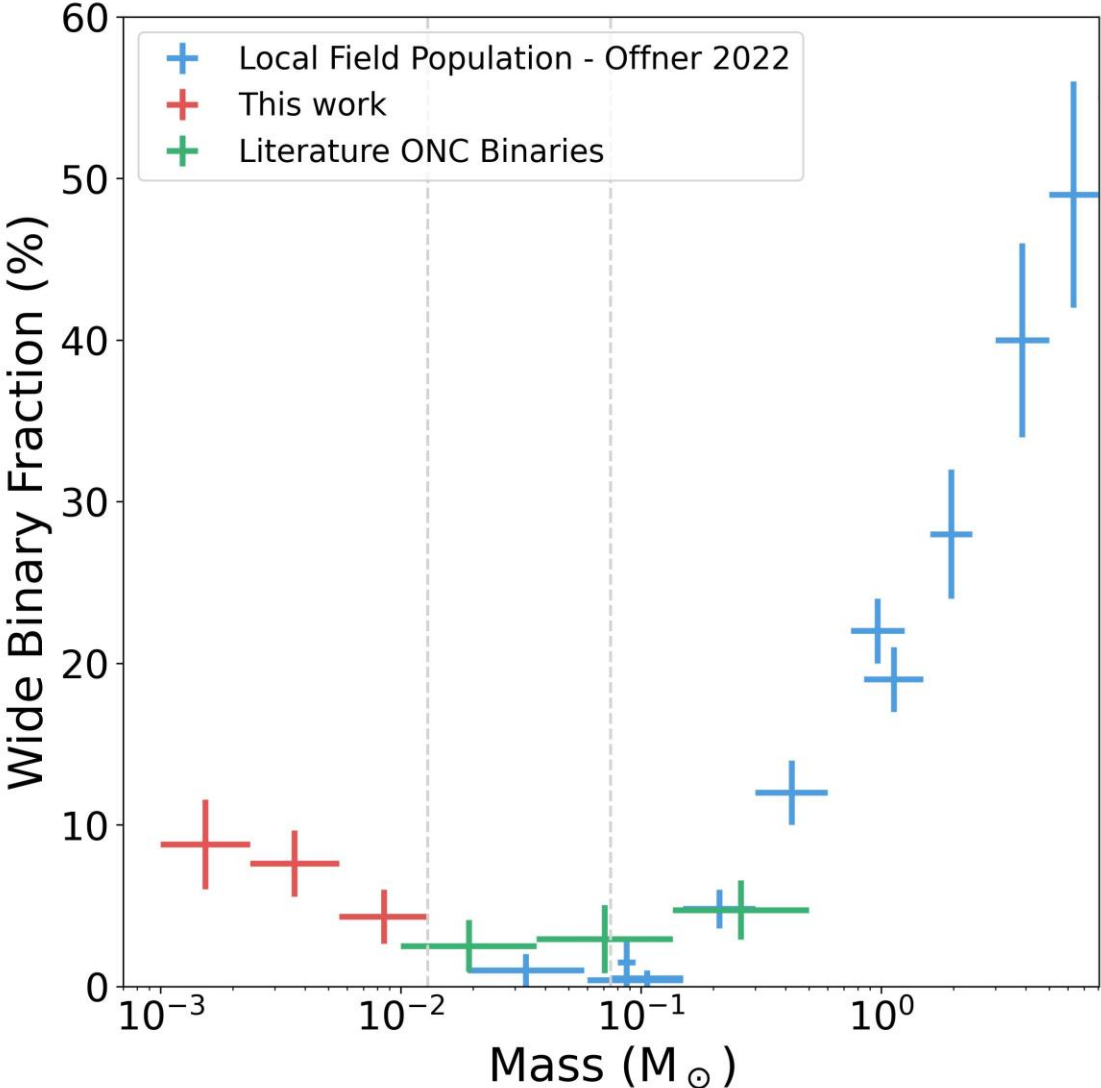


Jupiter Mass Binary Objects



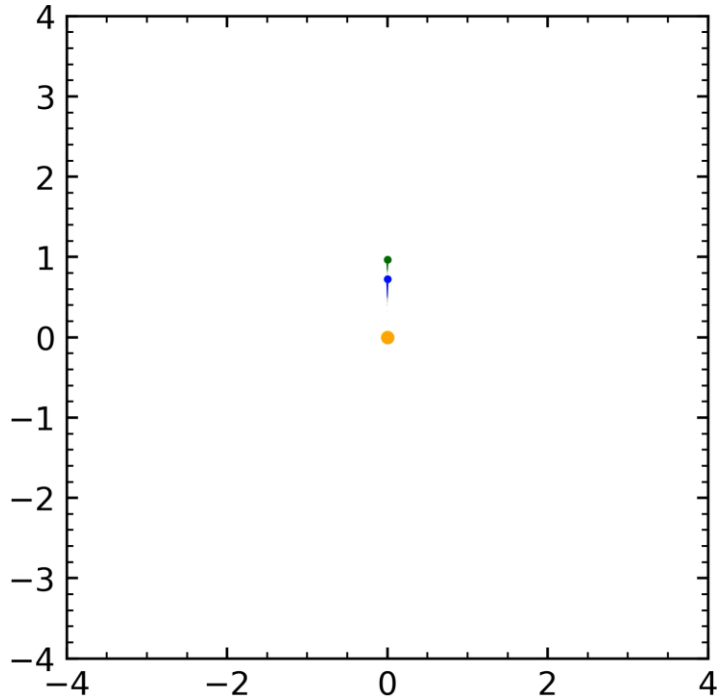
JUMBO_S

Why are JuMBOs so unexpected?

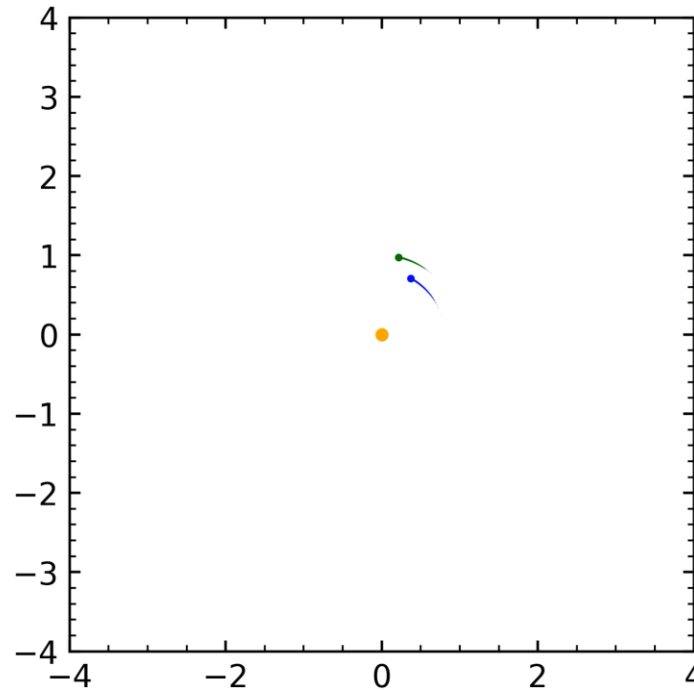


JuMBO formation from ejections

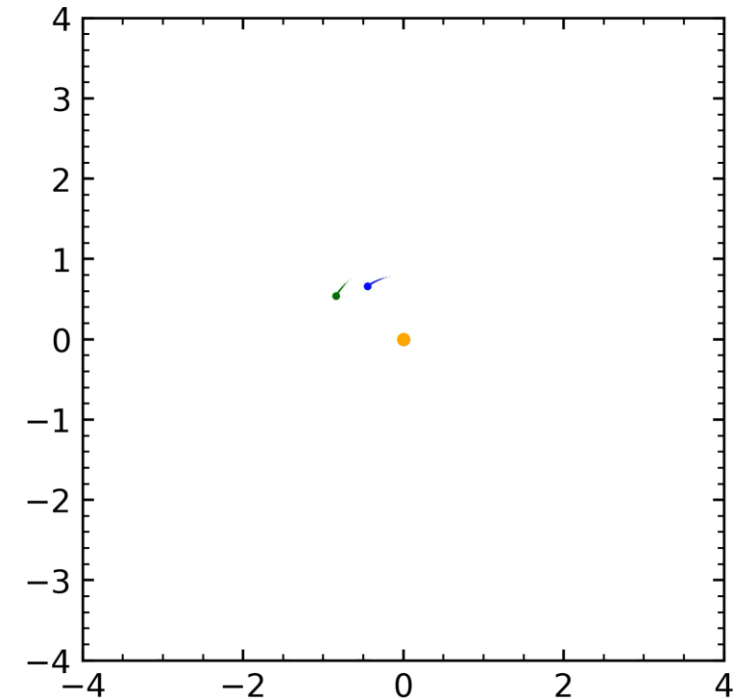
JuMBO formation from face-on scattering



JuMBO formation from edge-on scattering



Single Jupiter ejection



Videos from Wang, Perna and Zhu (2023) ⁸

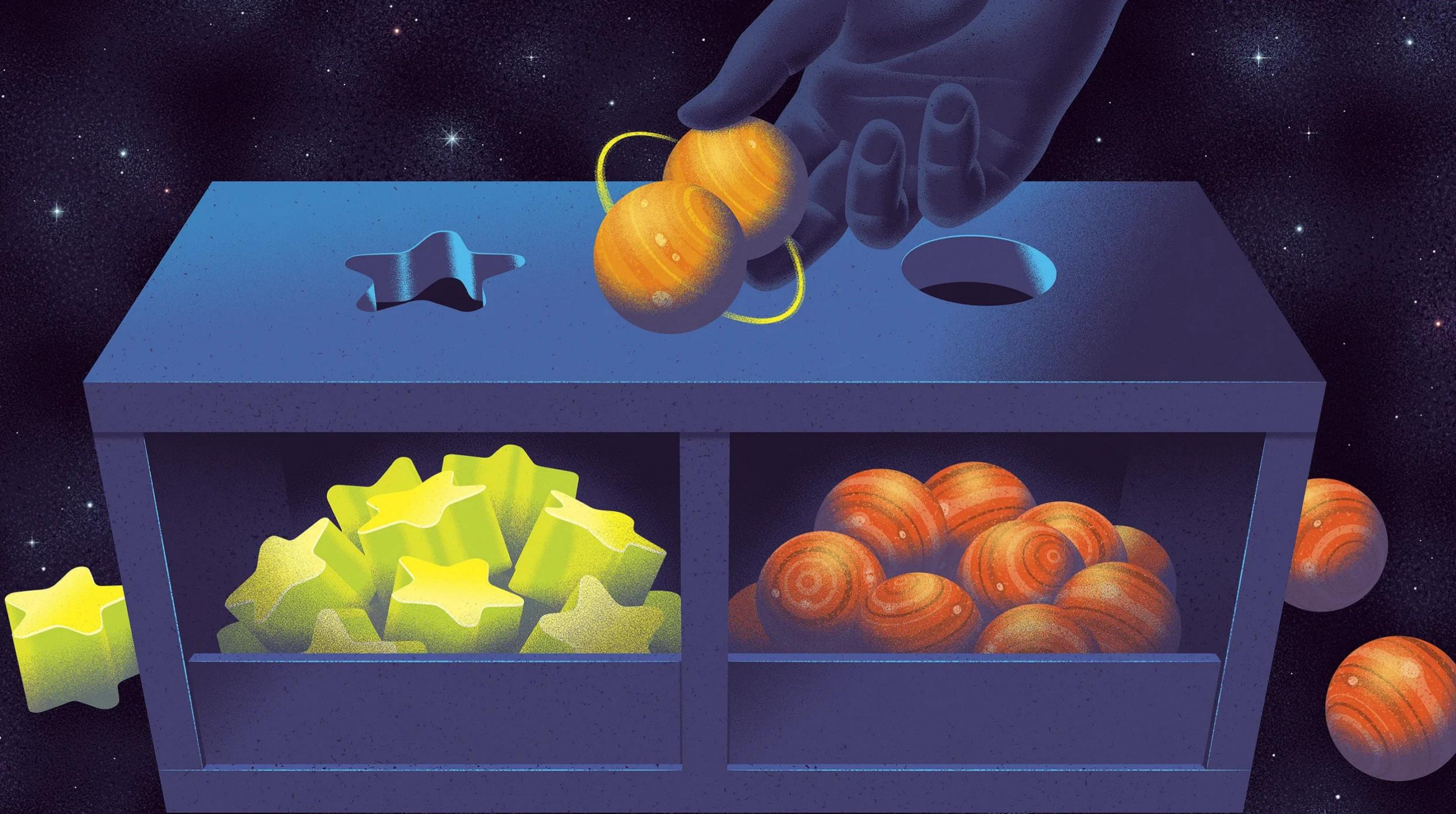


Image credit - Kouzou Sakai for *Quanta Magazine*



Space
Discovery of 'Jumbos' may herald new astronomical category

WIRED

These Rogue Worlds Upend the Theory of How Planets Form

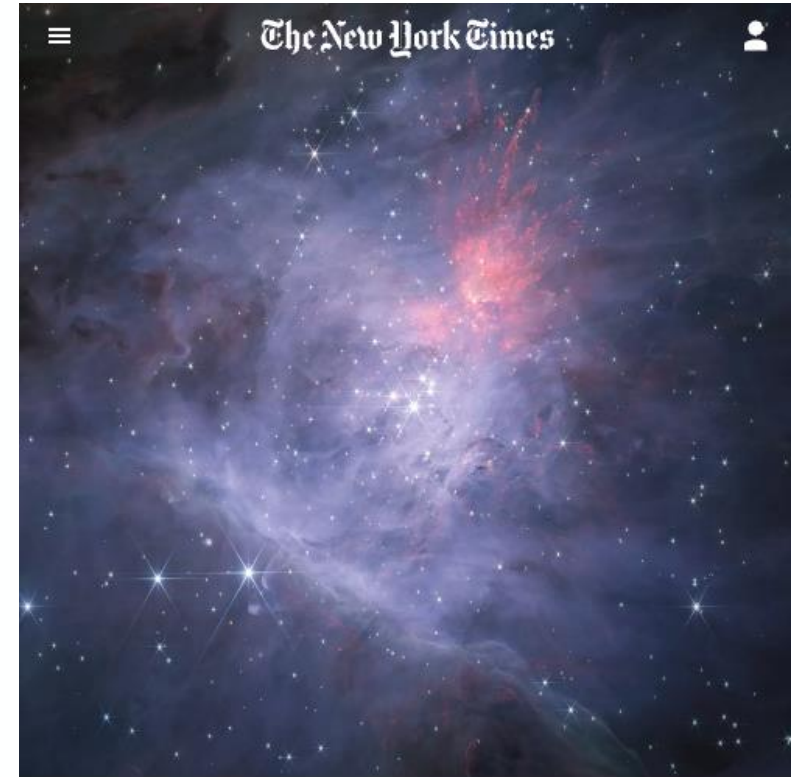


James Webb telescope makes 'JuMBO' discovery of planet-like objects in Orion

physicsworld

PLANETARY SCIENCE | RESEARCH UPDATE

Pairs of rogue planets found wandering in the Orion Nebula



An infrared composite image of the inner Orion Nebula and Trapezium Cluster captured by the James Webb Space Telescope. NASA, ESA, CSA/Mark McCaughrean & Sam Pearson

The Orion Nebula Is Full of Impossible Enigmas That Come in Pairs



JWST found LONE planets in the Orion Nebula and we can't explain them | Night Sky News October 2023
332K views · 3 months ago

James Webb Discovered Something So Improbable, It Shouldn't Ever Happen
438K views · 1 month ago

Two Supernovae Hit Earth // Rogue Planets in Orion Nebula // A Star That Disappeared
101K views · 3 months ago

James Webb Discovered Mysterious Planet-Like Objects That Float in Pairs in Space
22K views · 3 months ago

Webb Telescope Spots 40 Pairs Of Strange Objects Hiding In The Orion Nebula
5.3K views · 3 months ago

JWST Discovers Double Planets Without Stars In The Orion Nebula, But How Did They Form?
4K views · 2 months ago

NEW JWST DISCOVERY

JuMBOs
Jupiter Mass Binary Objects

and they have astronomers puzzled

OBJETOS MISTERIOSOS EM ORION JUMBOS

THESE ENIGMATIC

'Jupiter-Sized' Objects Seen Free-Floating In Space,

Jupiter-sized "planets" free-floating in space, unconnected to any star, have been spotted by the James Webb Space Telescope

bbc.co.uk

14K 818 Share



MYSTERIOUS OBJECTS IN NEW SPACE IMAGE!

JuMBOs
Jupiter Mass Binary Objects

BREAKING NEWS JWST

Library Objects !!

2023-10-2 2.2M

2023-10-5 47.3K

2023-10-3 125.9K

2023-10-4 388.2K

2023-10-4 244K

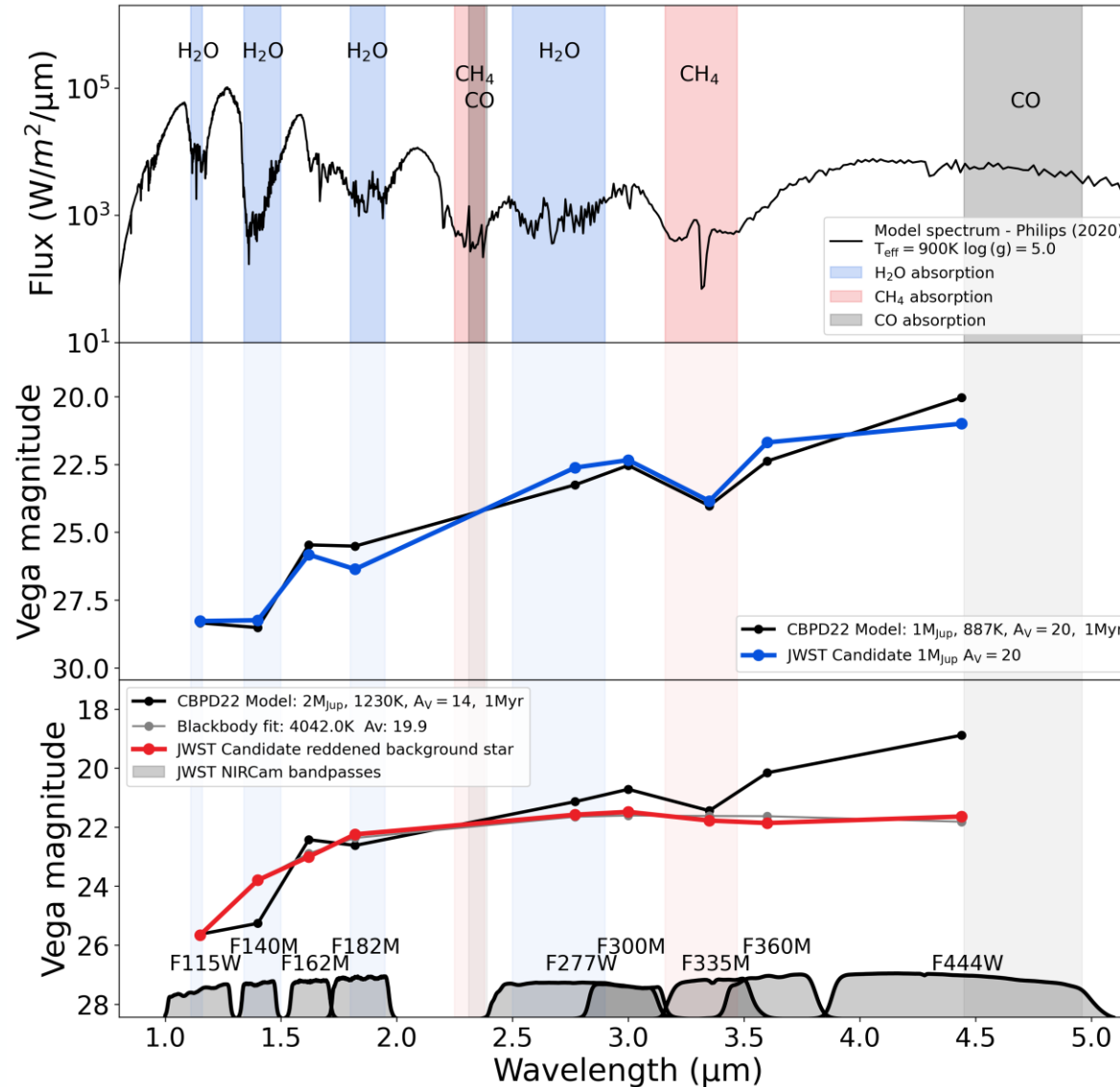
- We have directly imaged 540 planetary mass candidates between $0.6 - 13M_{\text{Jup}}$ (including 42 JuMBOs)
- JuMBOs are unexplained by the current theories of star and planet formation
- Beautiful Images! - ESA Sky: Orion

samuel.pearson@esa.int



How to identify planetary mass objects

- Faint
- Red
- H₂O absorption
- CH₄ absorption



How do we know they're in pairs?

$$N_{pairs} = \frac{1}{2} n(n - 1) \frac{\pi r_{sep}^2}{Area_{Total}}$$

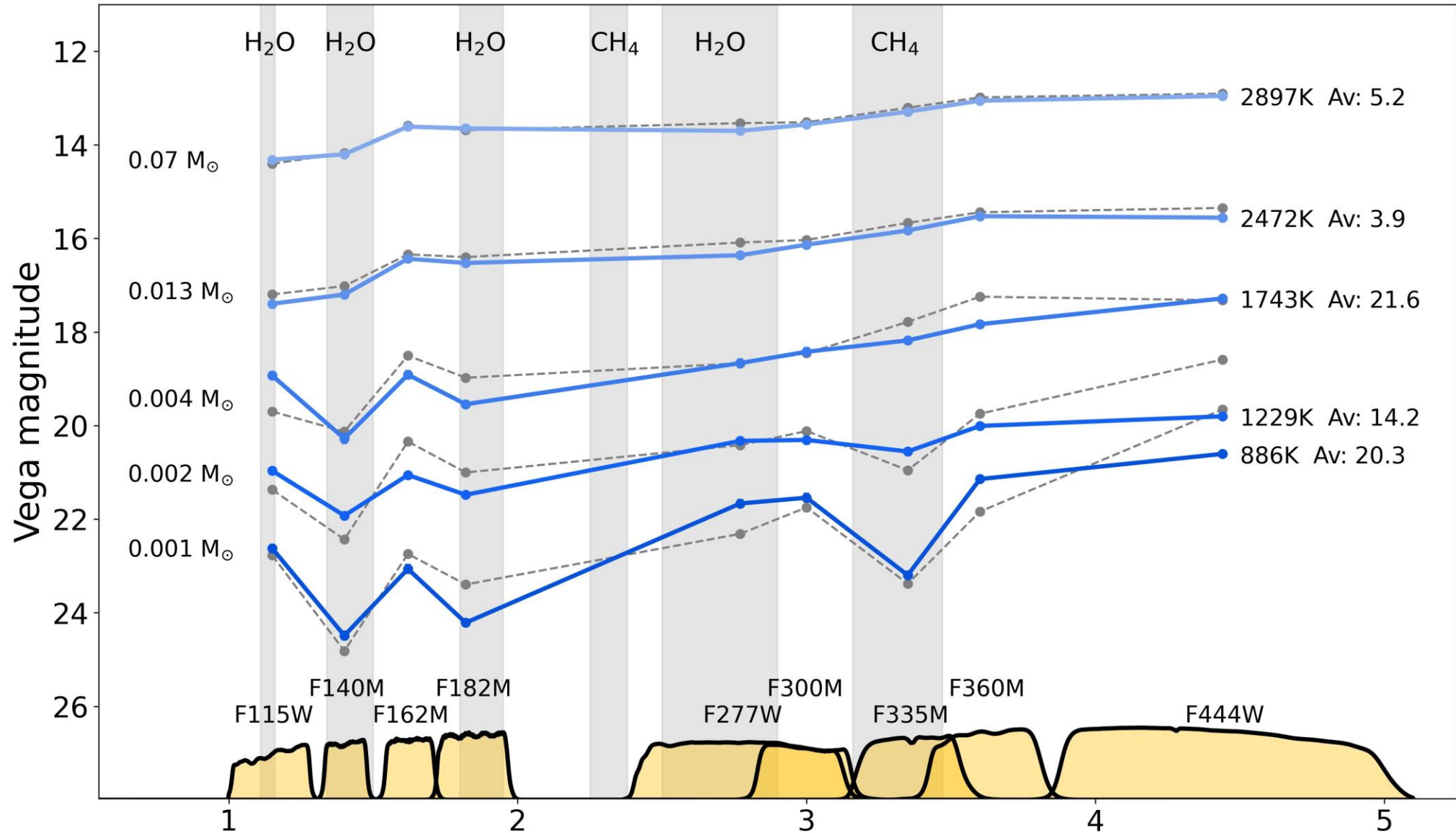
Struve Formula (1852)

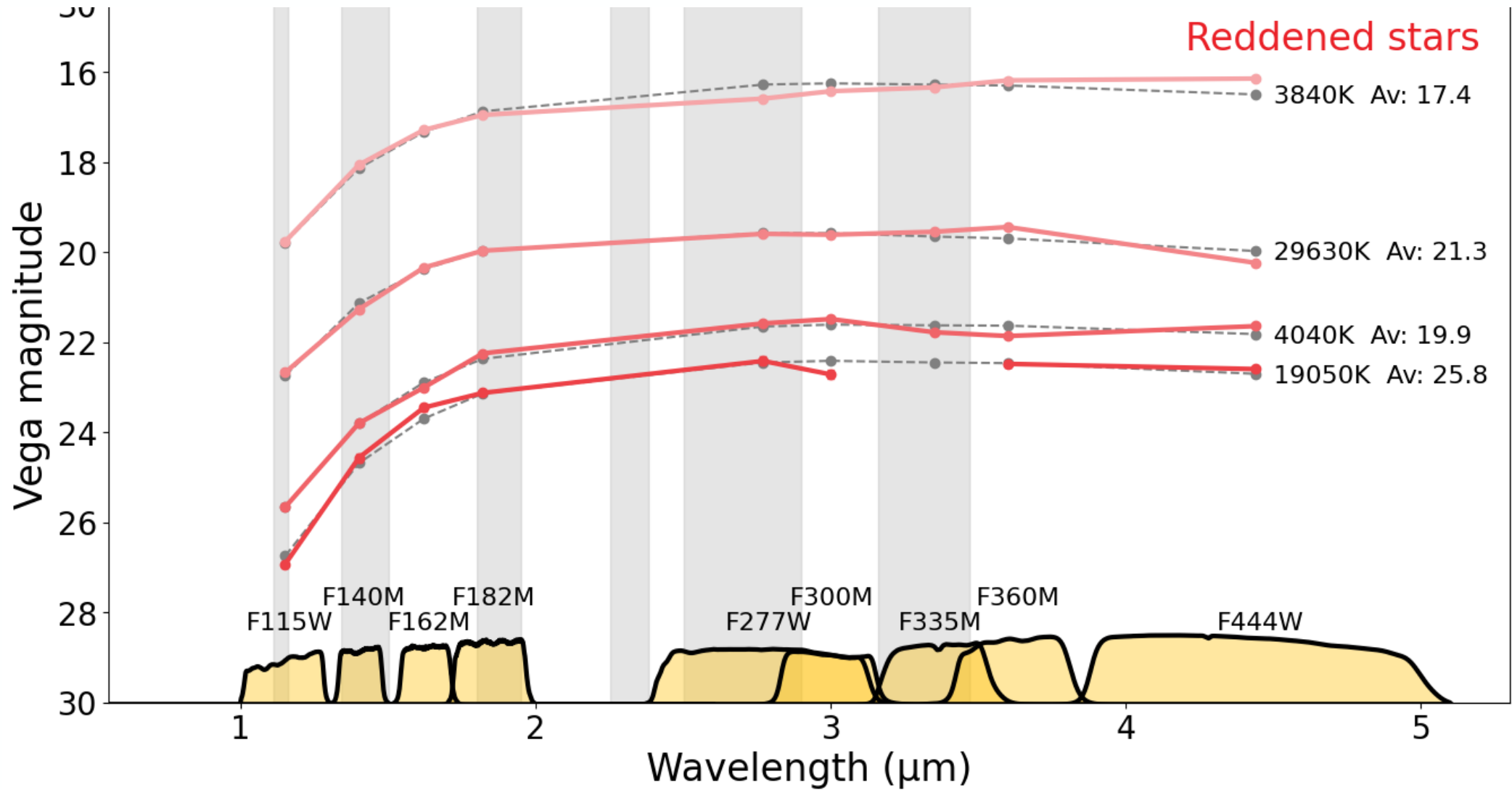
$$n = 540$$

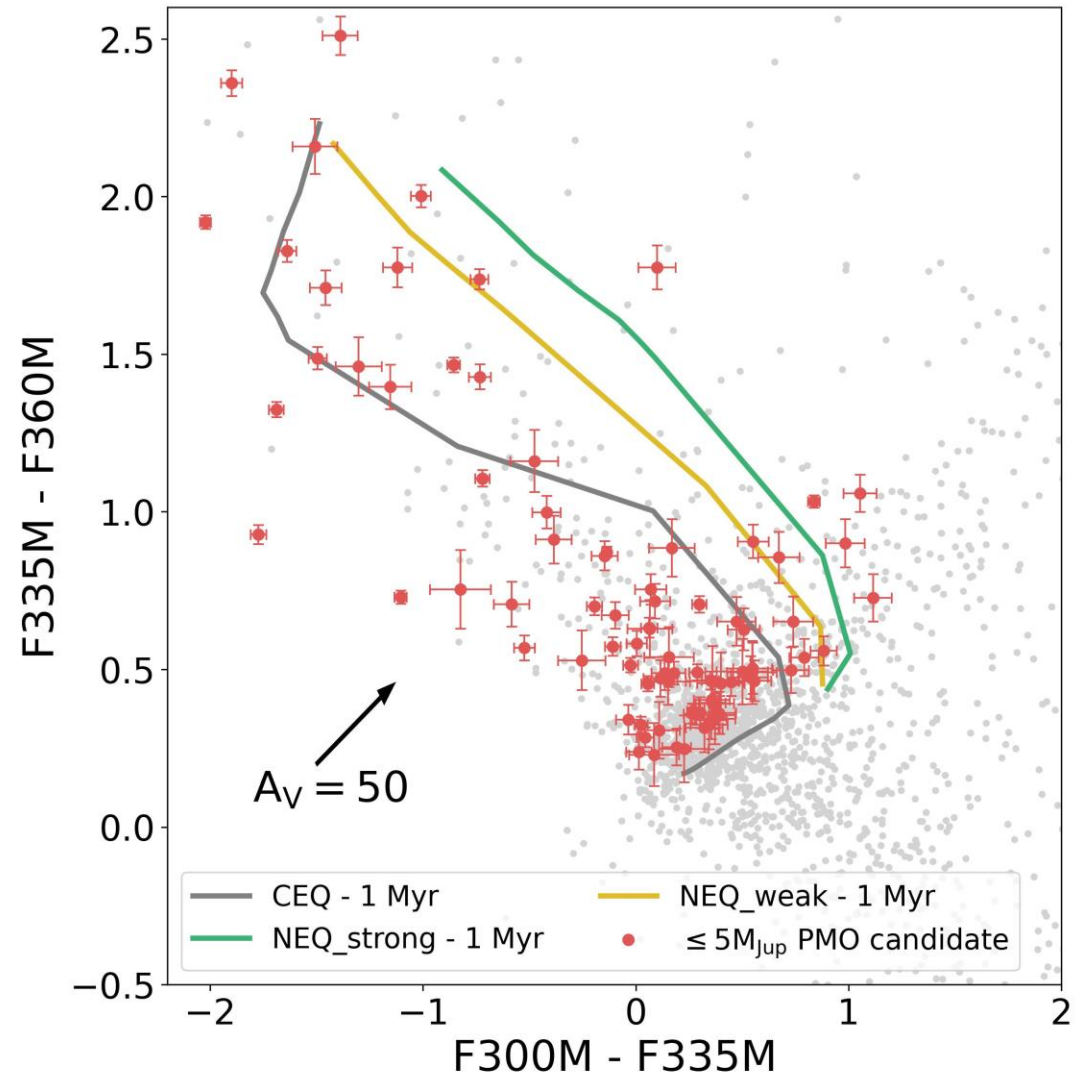
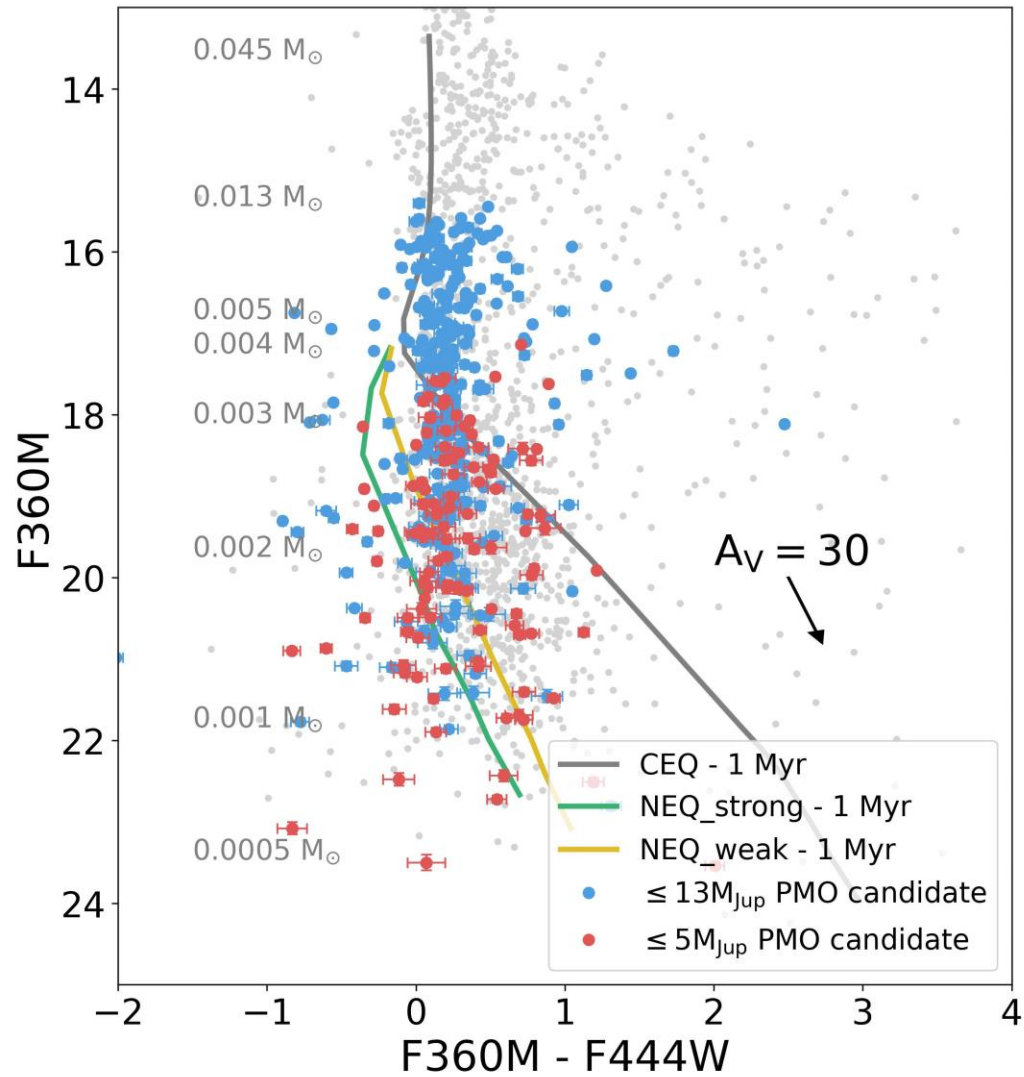
$$Area_{Total} = 11' \times 7.5'$$

$$r_{sep} = 1''$$

$$N_{pairs} = 1.53$$







sky.esa.int/esasky/?target=83.80876999%20-5.38735849&hips=2MASS+color+JHK&fov=0.31278158639986287&cooframe=J2000&sci=false&lang=en&jwst_image=webb_orio...

J2000 05 35 14.105 -05 23 14.49 FoV: 19' X 9.8' 2MASS color JHK

Sci. Mode En Feedback

Search...

Wide-angle view of the Orion Nebula (NIRCam long-wavelength)

One of the brightest nebulae in the night sky is Messier 42, the Orion Nebula, located south of Orion's belt. At its core is the young Trapezium Cluster of stars, the most massive of which illuminate the surrounding gas and dust with their intense ultraviolet radiation fields, while protostars continue to form today in the OMC-1 molecular cloud behind. The nebula is a treasure trove for astronomers studying the formation and early evolution of stars, with a rich diversity of phenomena and object...

Show More

Image Opacity

esa ALADIN

Proplyds

