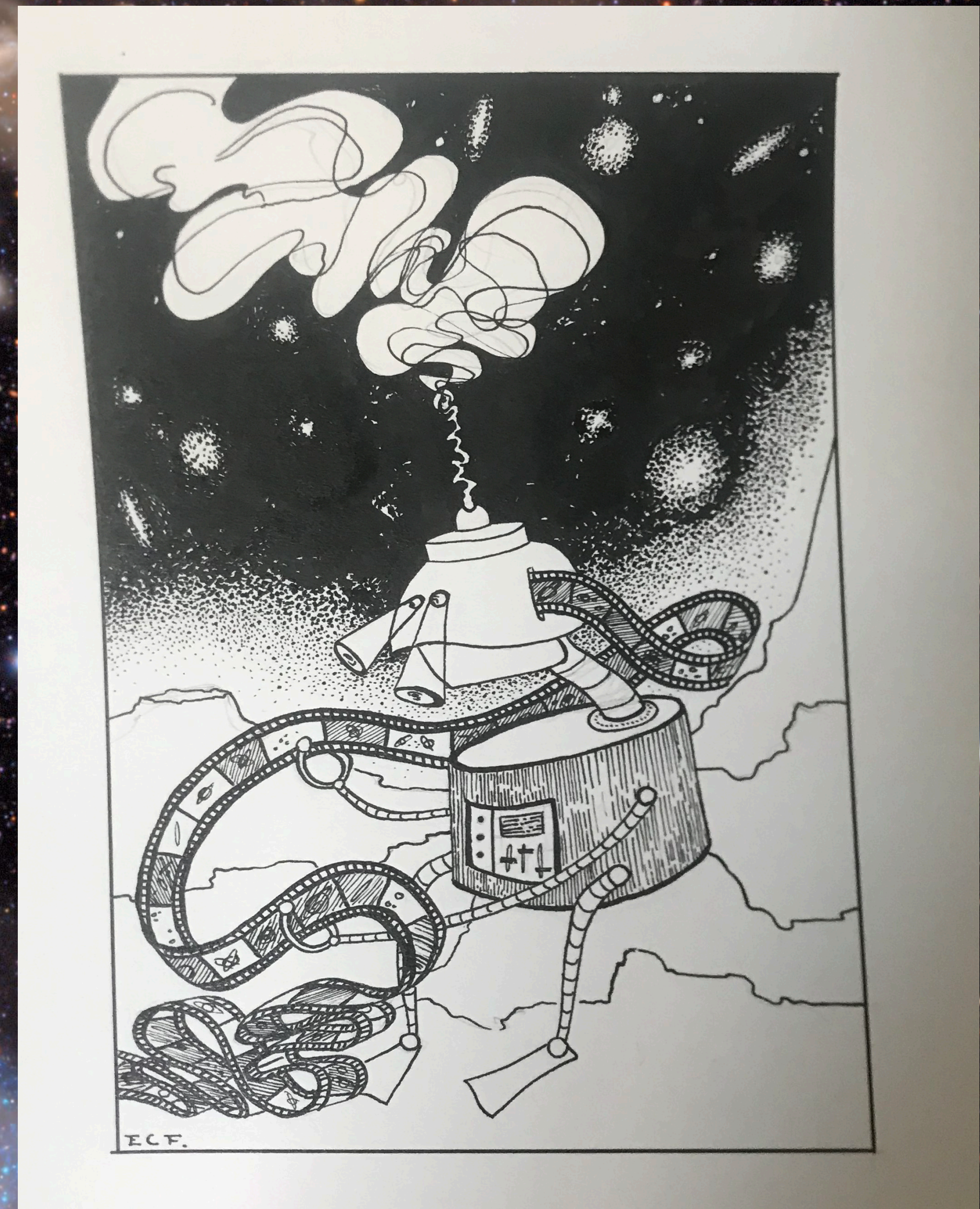


Lessons from the Zooniverse : *Citizen Science in the Rubin Observatory Era*

Chris Lintott

University of Oxford/Gresham College



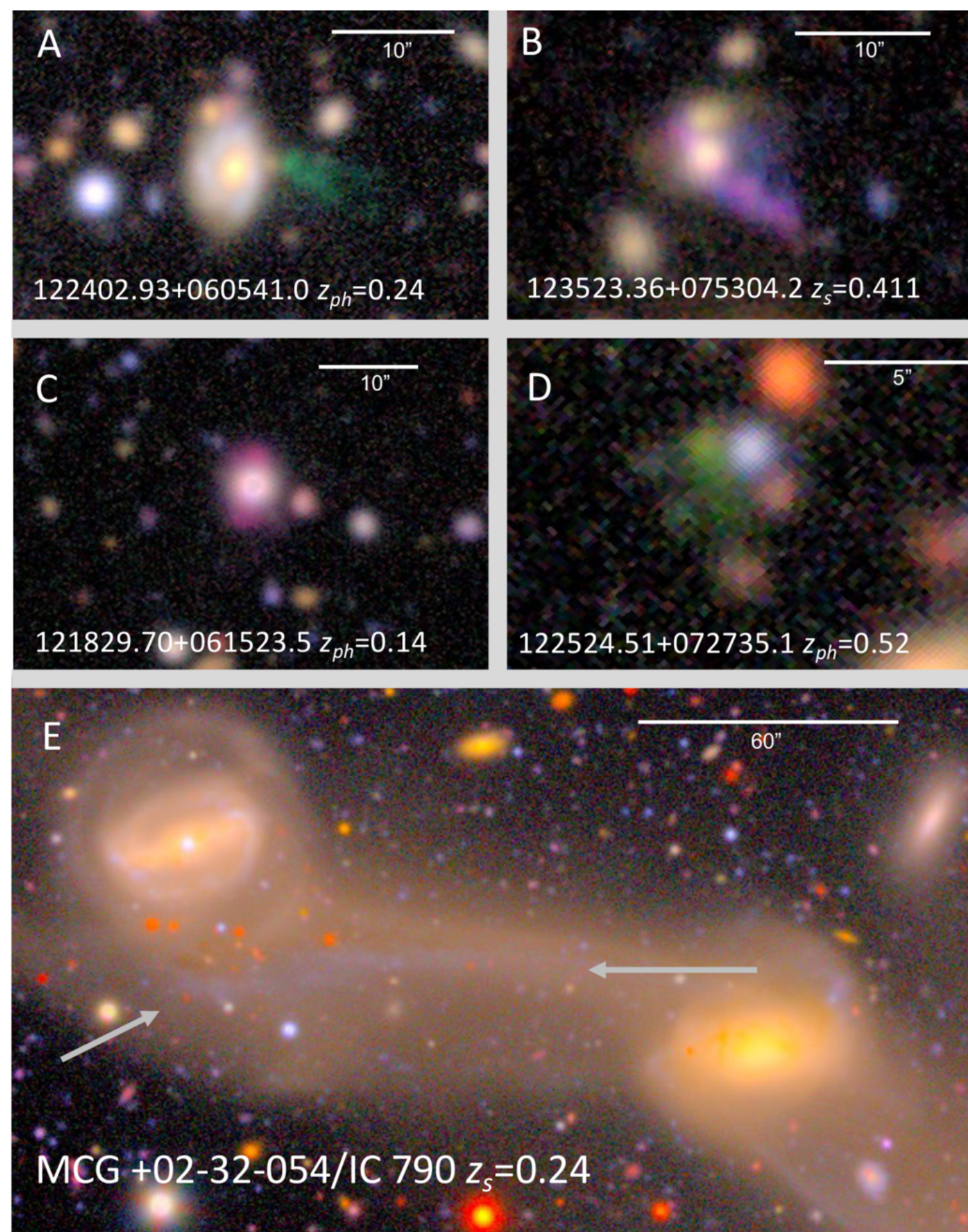






NSF-DOE Vera C. Rubin Observatory

Citizen Science is already happening



RNAAS RESEARCH NOTES OF THE AAS

OPEN ACCESS

Candidate AGN Extended Emission-line Regions in the Rubin Virgo Field

Alexander F. Jonkeren and William C. Keel

Published July 2025 • © 2025. The Author(s). Published by the American Astronomical Society.

[Research Notes of the AAS, Volume 9, Number 7](#)

Citation Alexander F. Jonkeren and William C. Keel 2025 *Res. Notes AAS* 9 201

DOI 10.3847/2515-5172/adf324

[Authors](#) ▼ [Figures](#) ▼ [References](#) ▼

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Abstract

As both a test and demonstration of the power of the Legacy Survey of Space and Time (LSST) data for this purpose, we present a set of 5 candidate active galactic nucleus-ionized extended emission-line regions in the Rubin Virgo field, based on visual color selection. Although still pending spectroscopic confirmation, these illustrate the depth of detection of the LSST data compared to existing broadband surveys, even for these irregularly shaped objects with almost pure emission spectra.



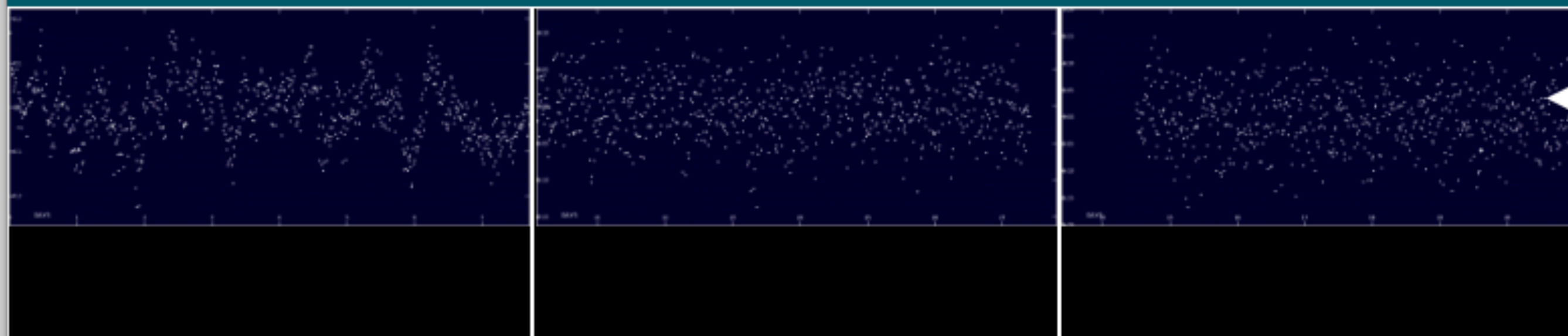
Planet Hunters TESS

ABOUT CLASSIFY TALK COLLECT RECENTS LAB

Join the Search for Undiscovered Worlds

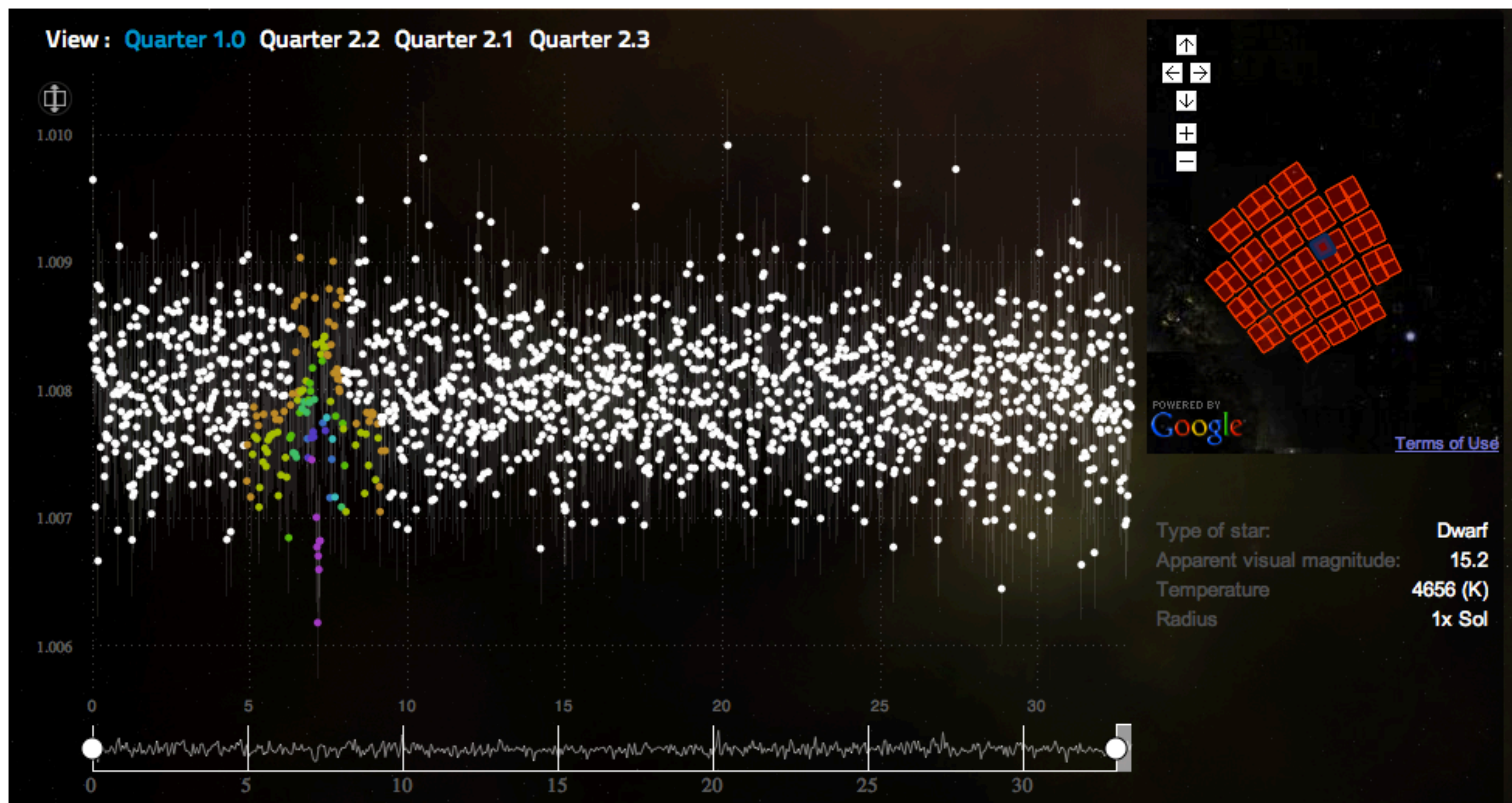
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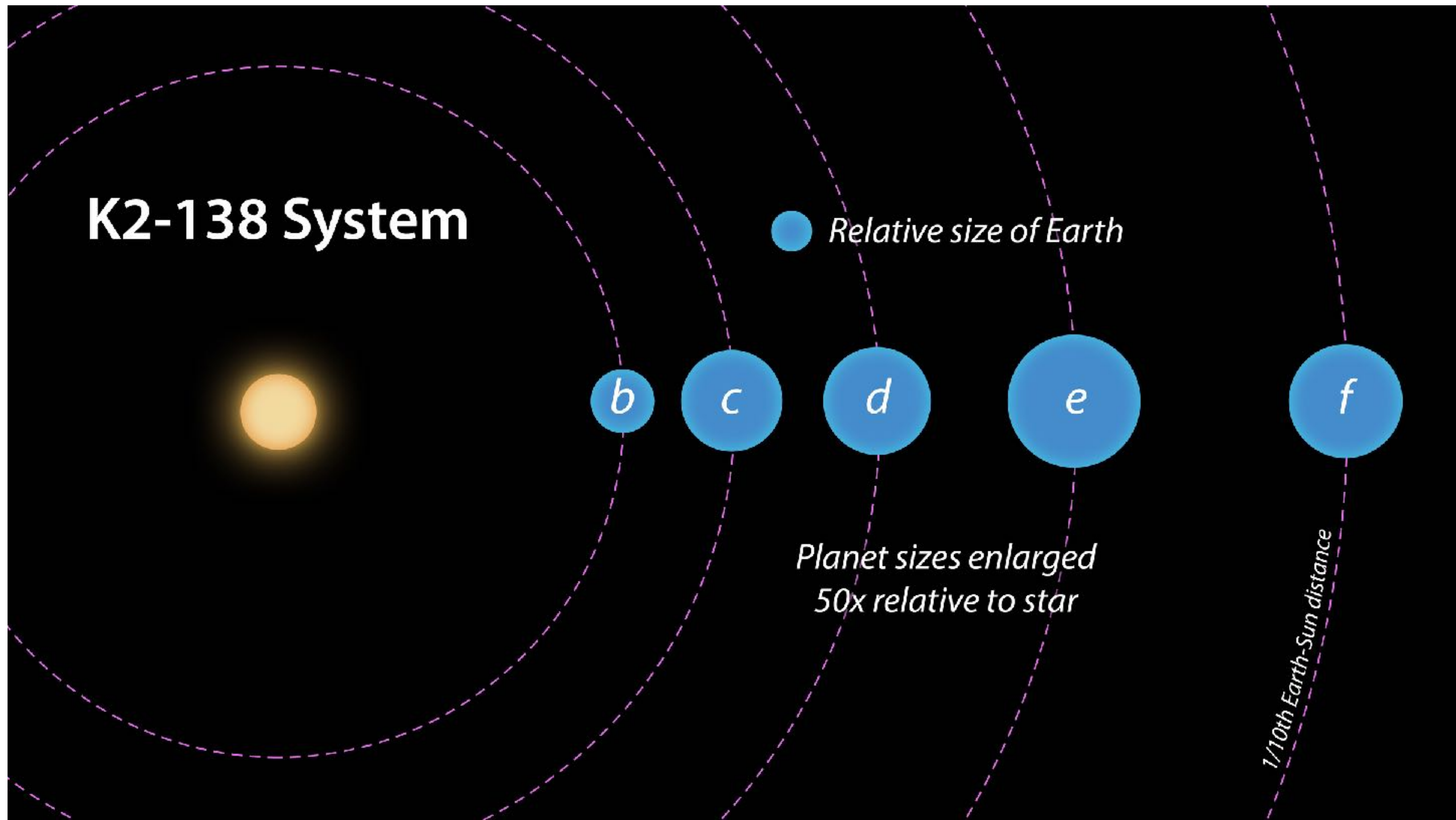
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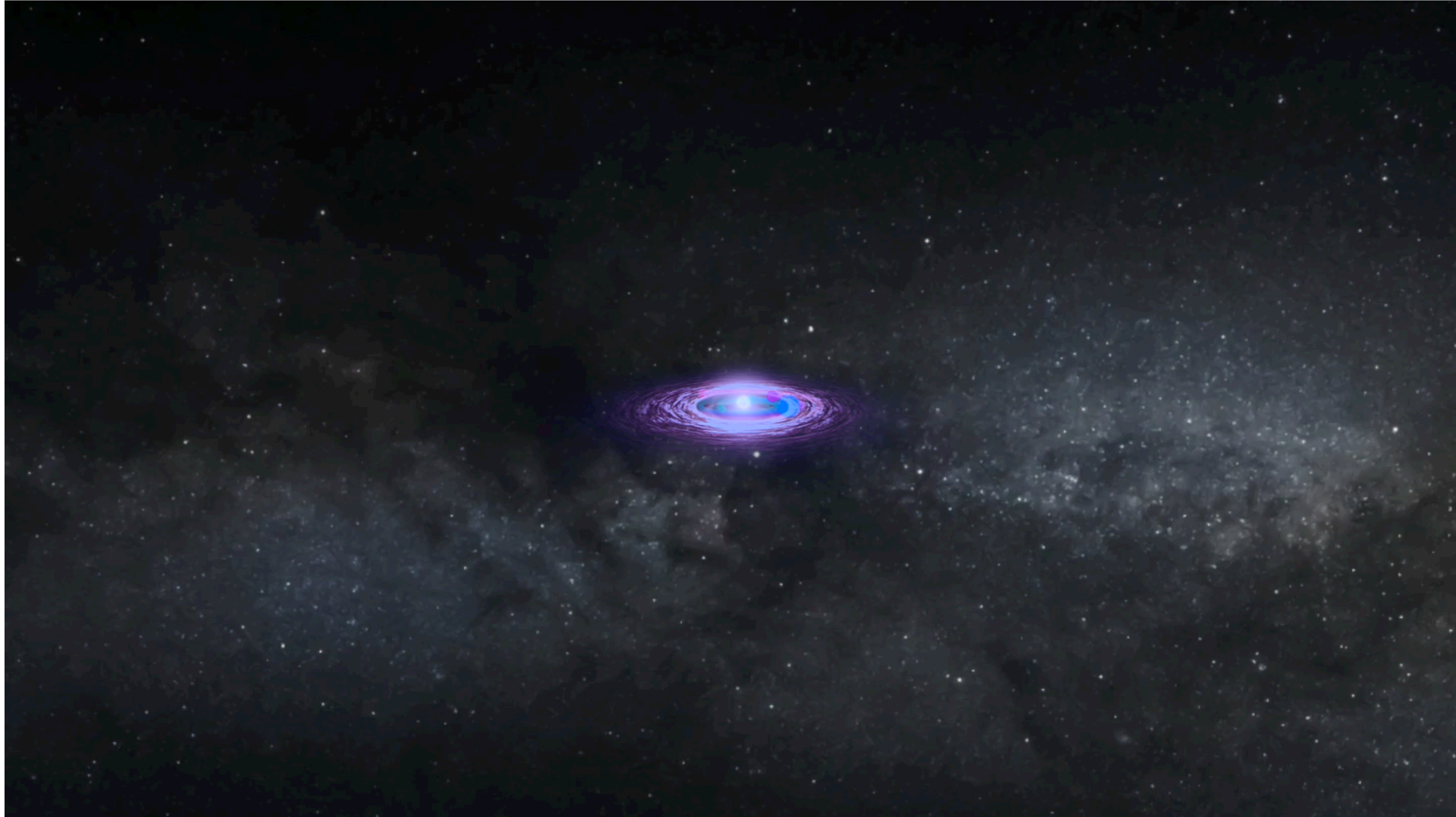


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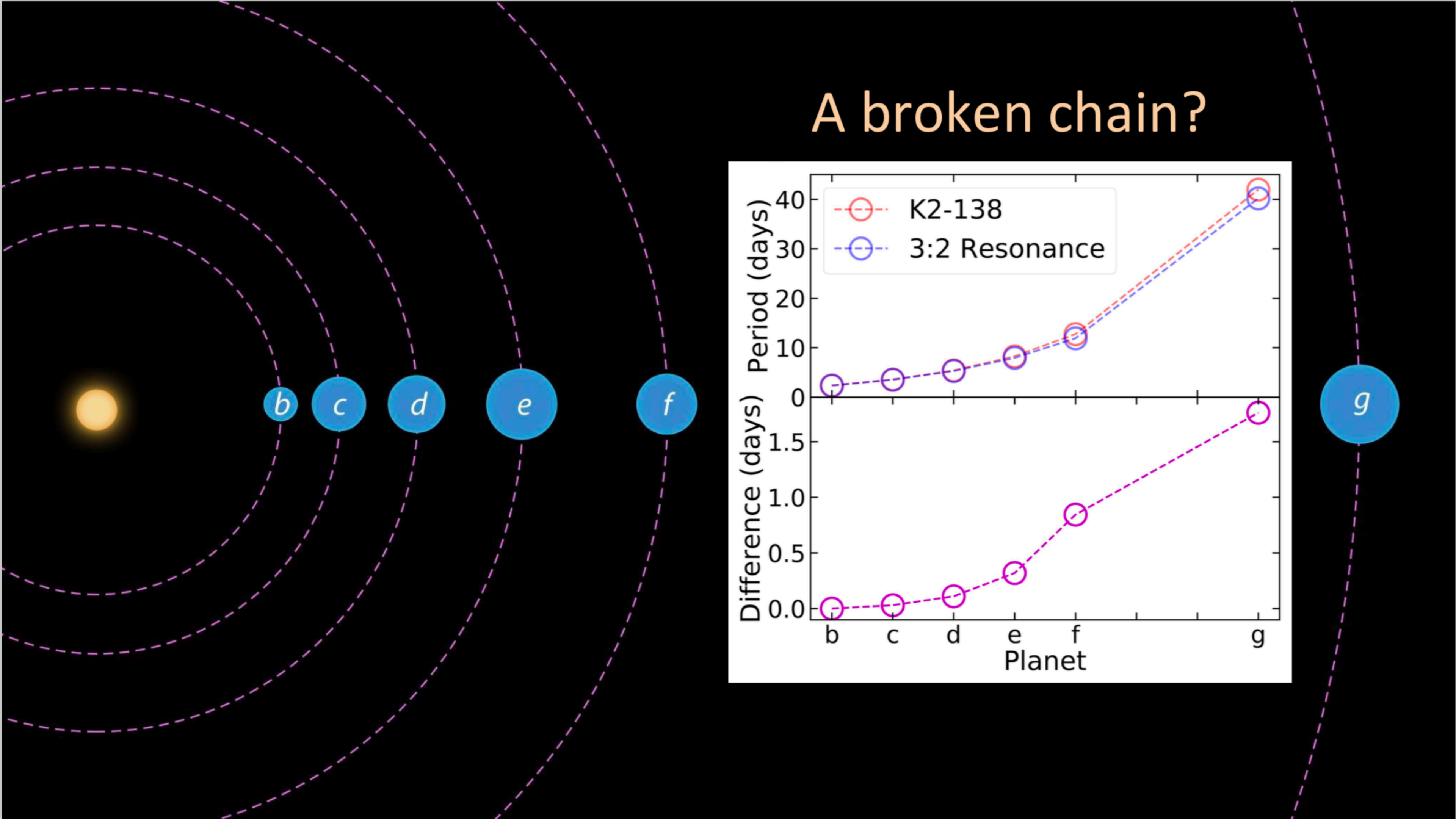




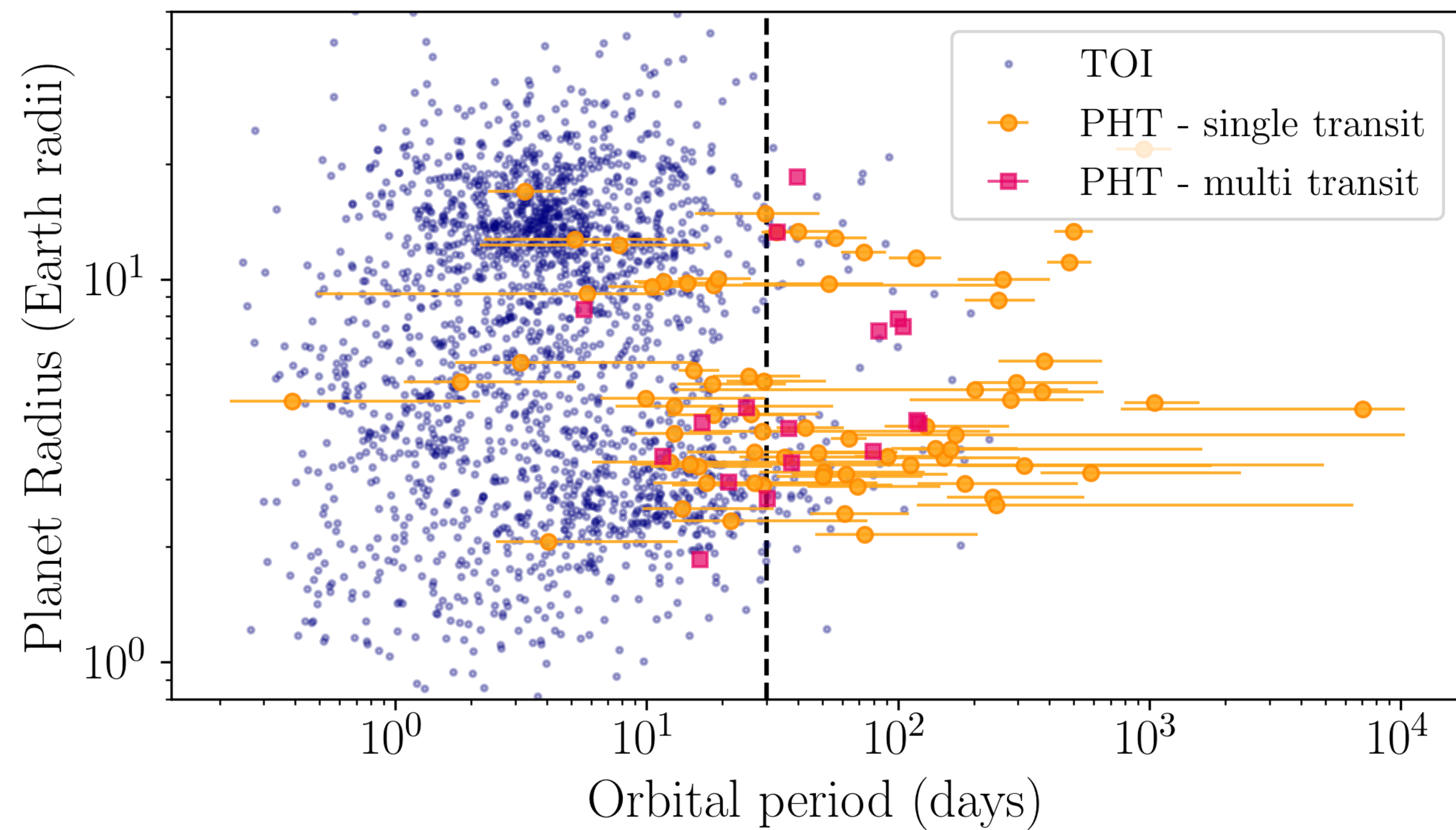
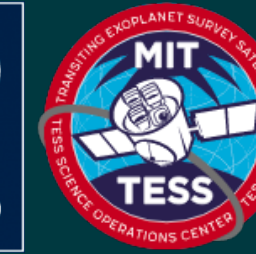


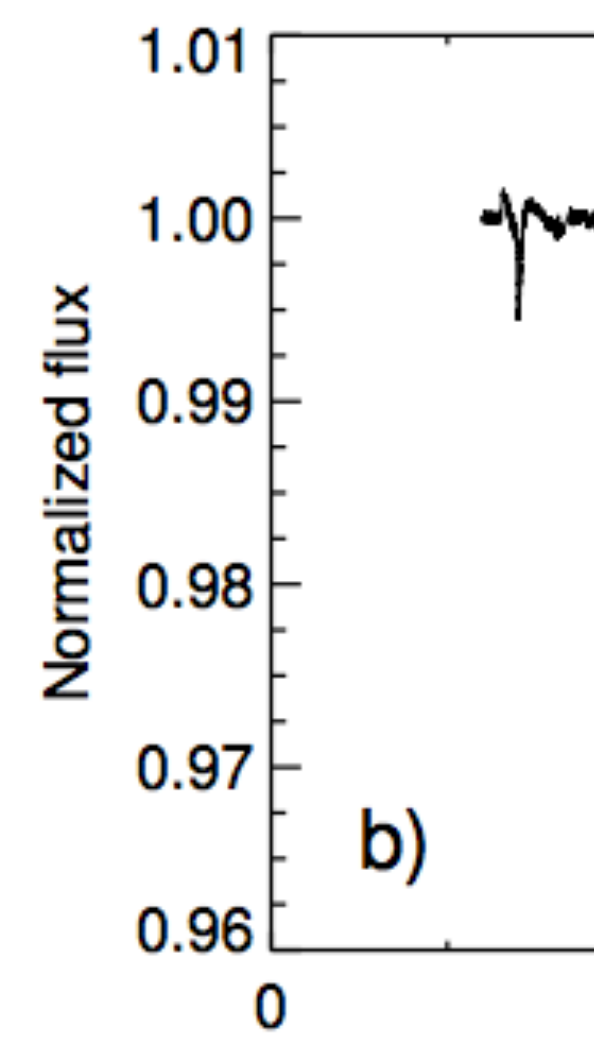
@astromattrusso

A broken chain?



First two years of PHT





Planet Hunters X.

KIC 8462852 – Where’s the flux? ^{*}†

T. S. Boyajian¹, D. M. LaCourse², S. A. Rappaport³,
D. Fabrycky⁴, D. A. Fischer¹, D. Gandolfi^{5,6}, G. M. Kennedy⁷, H. Korhonen^{8,9}, M. C.
Liu¹⁰, A. Moor¹¹, K. Olah¹¹, K. Vida¹¹, M. C. Wyatt⁷, W. M. J. Best¹⁰, J. Brewer¹,
F. Ciesla¹², B. Csák¹³, H. J. Deeg^{14,15}, T. J. Dupuy¹⁶, G. Handler¹⁷, K. Heng¹⁸, S. B.
Howell¹⁹, S. T. Ishikawa²⁰, J. Kovács¹³, T. Kozakis²¹, L. Kriskovics¹¹, J. Lehtinen²², C.
Lintott²³, S. Lynn²⁴, D. Nespral^{14,15}, S. Nikbakhsh^{22,25}, K. Schawinski²⁶, J. R. Schmitt¹,
A. M. Smith²⁷, Gy. Szabó^{11,13,28}, R. Szabó¹¹, J. Viuhko²², J. Wang^{1,29}, A. Weksnar²⁰, M.
Bosch², J. L. Connors², S. Goodman², G. Green², A. J. Hoekstra², T. Jebson², K. J. Jek²,
M. R. Omohundro², H. M. Schwengeler², A. Szewczyk²

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¹²Department of the Geophysical Sciences, The University of Chicago, 5734 South Ellis Avenue, Chicago, IL 60637

¹³ELTE Gothard Astrophysical Observatory, H-9704 Szombathely, Szent Imre herceg ut 112, Hungary

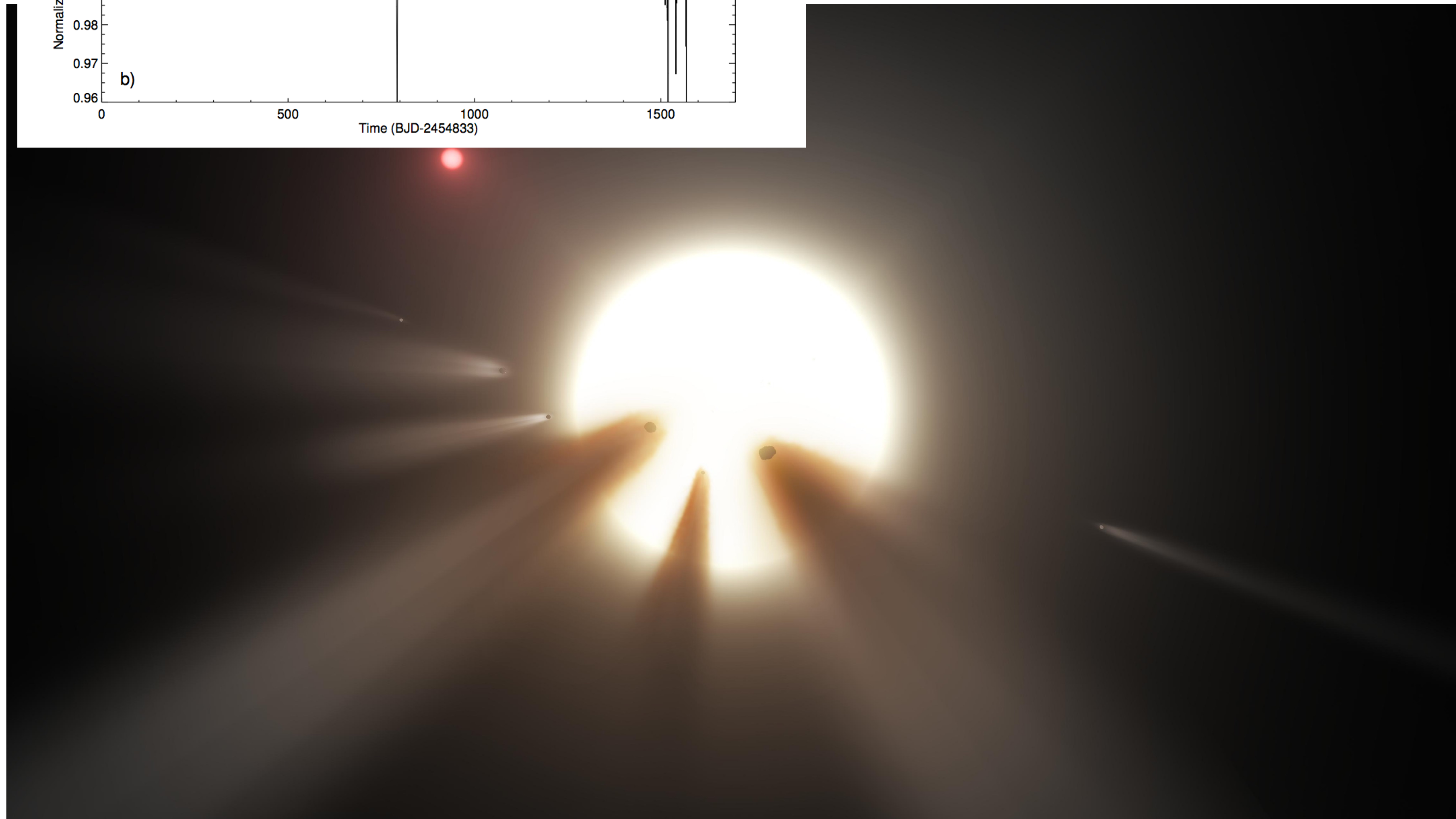
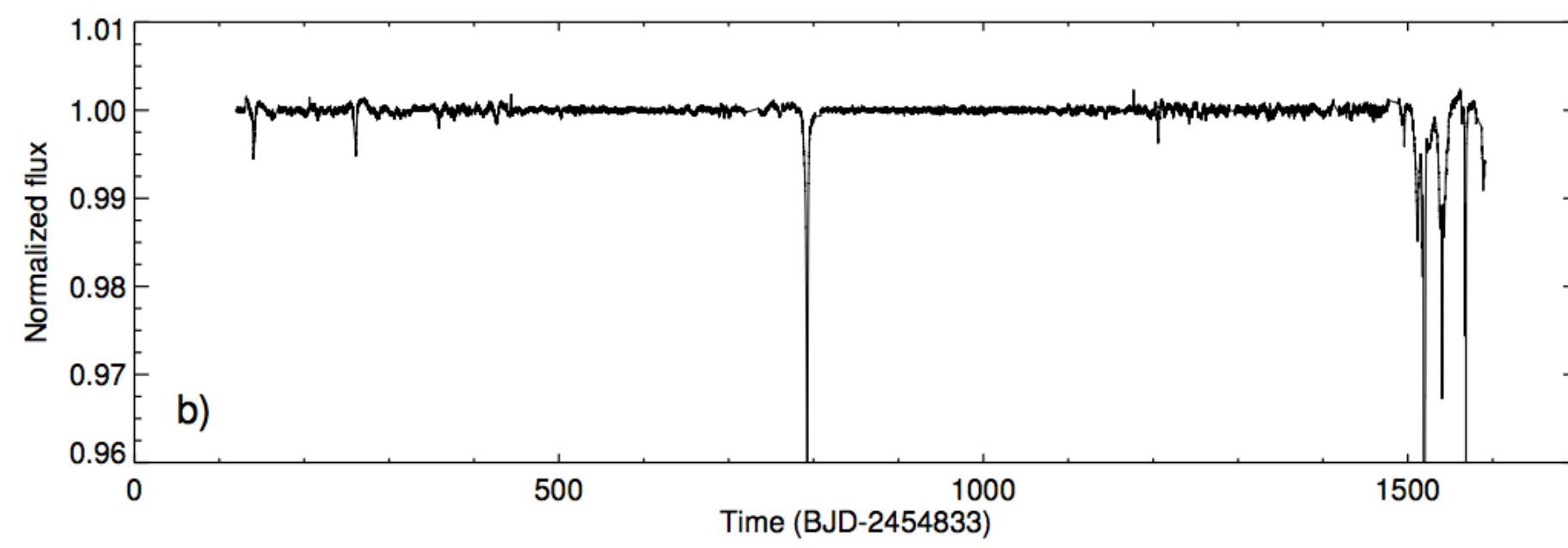
¹⁴Instituto de Astrofísica de Canarias, C. Vía Láctea S/N, E-38205 La Laguna, Tenerife, Spain

¹⁵Departamento de Astrofísica, Universidad de La Laguna, E-38200 La Laguna, Tenerife, Spain



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have scientists found alien xComputers Would Never H xThe story behind 'alien me xAstronomers may have fou xHas Nasa's Kepler Telesco xYou

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News > World

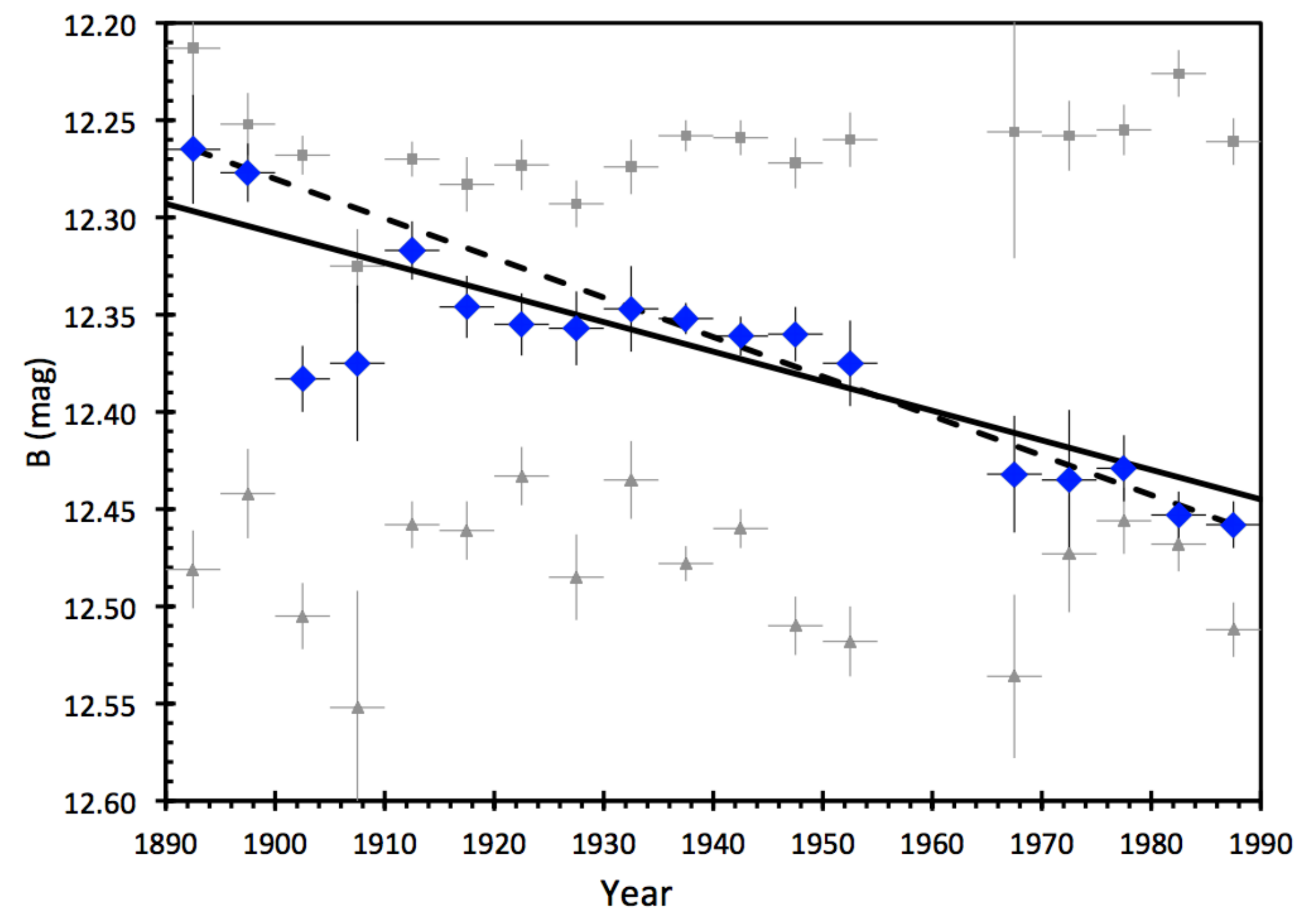
Astronomers may have found giant alien 'megastructures' orbiting star near the Milky Way

A star identified by the Kepler Space Telescope may harbour structures which could point to an advanced technological civilisation

Lee Williams | @leeroy112 | Friday 16 October 2015 | Comment



www.independent.co.uk/author/lee-williams







Tabetha Boyajian  @tsboyajian
CALL TO ACTION!!

May 19

Jason Wright @Astro_Wright

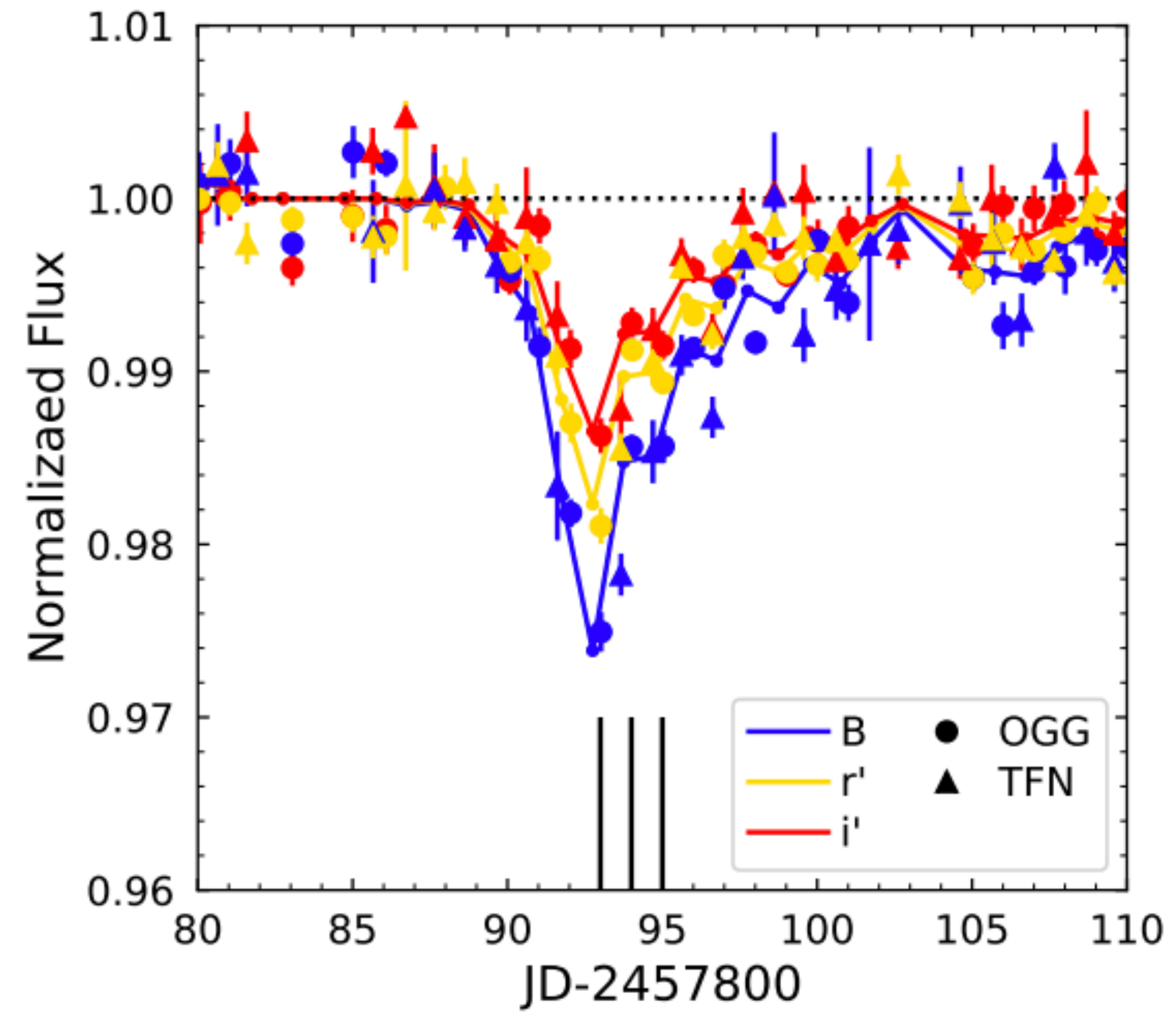
ALERT:

@tsboyajian's star is dipping

This is not a drill.

Astro tweeps on telescopes in the next 48
hours: spectra please!





nature

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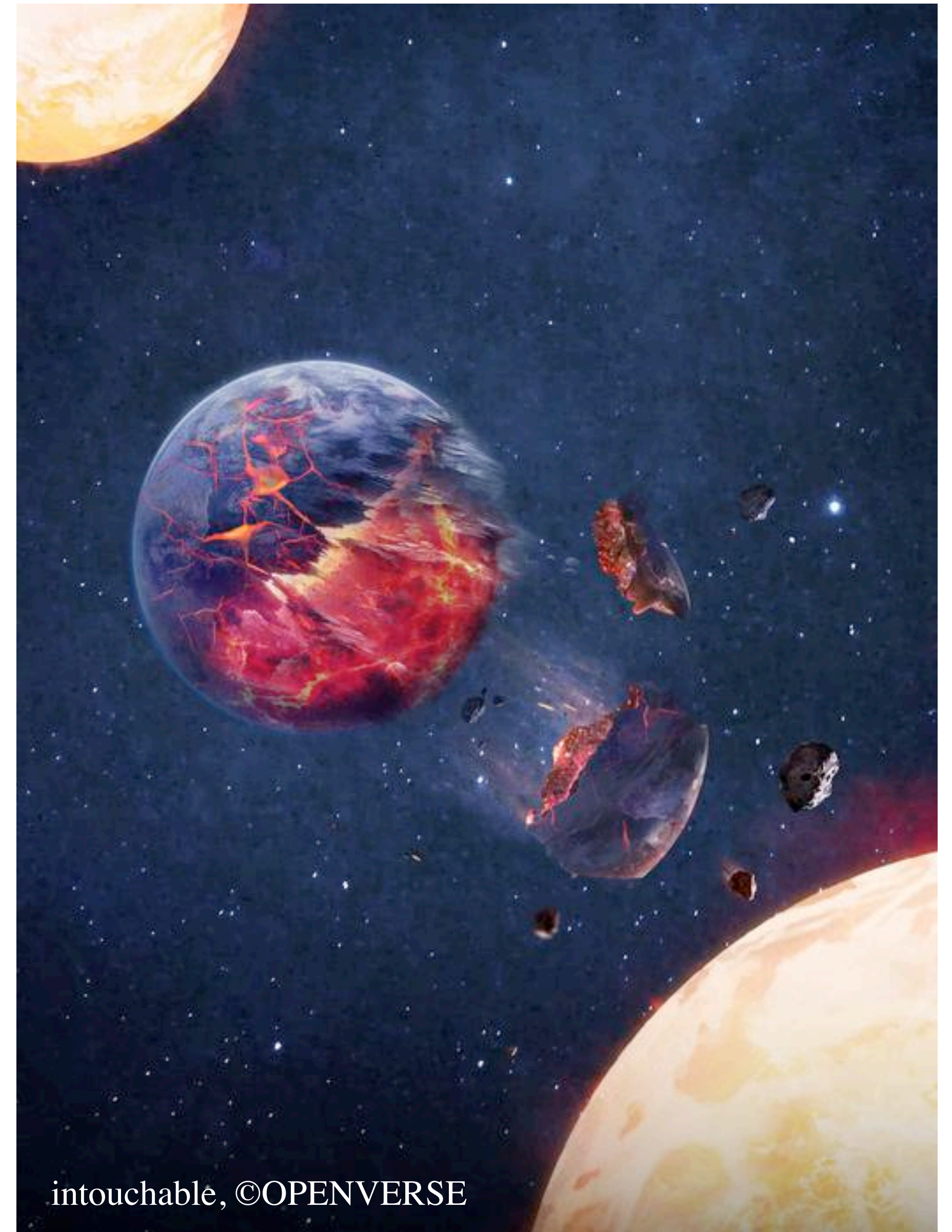
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Article | Published: 20 March 2024

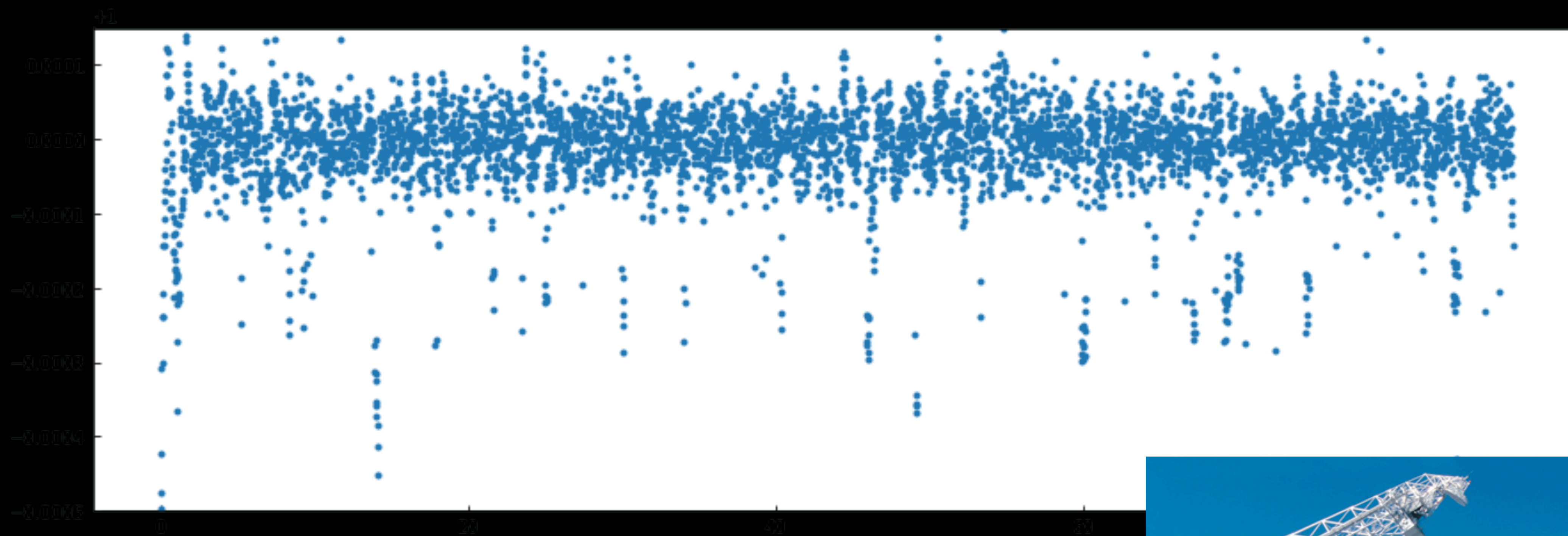
At least one in a dozen stars shows evidence of planetary ingestion

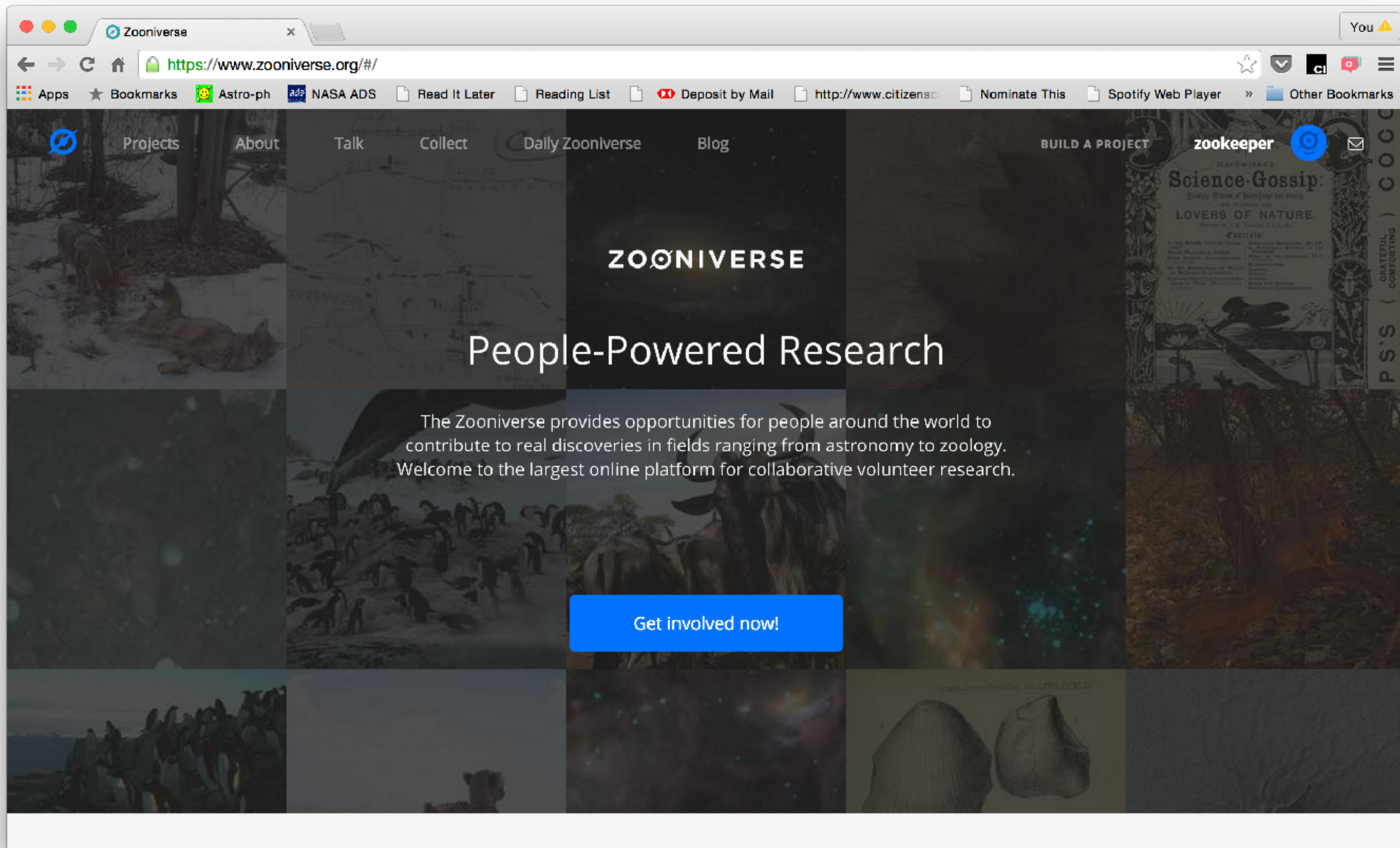
[Fan Liu](#) , [Yuan-Sen Ting](#), [David Yong](#), [Bertram Bitsch](#), [Amanda Karakas](#), [Michael T. Murphy](#), [Meridith Joyce](#), [Aaron Dotter](#) & [Fei Dai](#)

[Nature](#) **627**, 501–504 (2024) | [Cite this article](#)



intouchable, ©OPENVERSE





www.zooniverse.org/lab

The screenshot shows a web browser window with two tabs: 'Edit » Supernovae — Zooniverse' and 'Supernovae » Classify — Zooniverse'. The address bar shows 'localhost:3735/#/lab/2/workflow/2'. The Zooniverse logo is in the top left, and 'brian-testing' with 'Sign out' and 'Settings' links is in the top right. A navigation bar includes 'About', 'Projects', 'Discuss', and 'THE LAB'. The left sidebar has sections for 'PROJECT #2' (Project details, Science case, Results, FAQ, Education, Collaborators), 'WORKFLOWS' (Start searching, Tell the time, New workflow), and 'SUBJECT SETS' (Untitled subject set, Just a few, New subject set, Delete this project). The main content area is titled 'WORKFLOW TITLE' and shows 'Start searching' with 'Version 6687.6693'. Below this is a 'TASKS' list with five items, the third of which is selected: 'What is wrong with the candidate?'. A red warning message states: 'You're editing a workflow on a public project. Please note that any changes will result in the loss of your existing classifications for this workflow!'. A 'Save changes' button is below the tasks. To the right, the 'MAIN TEXT' field contains 'What is wrong with the candidate?' and the 'HELP TEXT' field is empty. Below these are 'CHOICES' with 'Multiple choice' and 'Required' options. Four choice boxes are visible, each with a 'Next task' dropdown set to '(End of classification!)': 'Not circular - too small', 'Not circular - elongated', 'Not circular - distorted', and 'Not circular - diffuse'.

www.zooniverse.org/lab

localhost:3735/#/lab/2/workflow/2

ZOONIVERSE brian-testing Sign out Settings

About Projects Discuss THE LAB

PROJECT #2

- Project details
- Science case
- Results
- FAQ
- Education
- Collaborators

WORKFLOWS

- Start searching
- Tell the time
- New workflow

SUBJECT SETS

- Untitled subject set
- Just a few
- New subject set
- Delete this project

WORKFLOW TITLE

Start searching

Version 6687.6693

TASKS

- Is there a candidate centered in the crosshairs of the right-hand image? (first)
- Has the candidate itself subtracted correctly?
- What is wrong with the subtraction?
- Is the candidate star-like and approximately circular?
- What is wrong with the candidate?**
- Is the candidate centered in a circular host galaxy?

Add task Question Drawing

You're editing a workflow on a public project. Please note that any changes will result in the loss of your existing classifications for this workflow!

Save changes

ASSOCIATED SUBJECT SETS

NOTE: Assigning subject sets doesn't quite work as expected right now. To-do on the back end.

MAIN TEXT

What is wrong with the candidate?

HELP TEXT

CHOICES ☐ Multiple choice ☐ Required

Not circular - too small

Next task

(End of classification!)

Not circular - elongated

Next task

(End of classification!)

Not circular - distorted

Next task

(End of classification!)

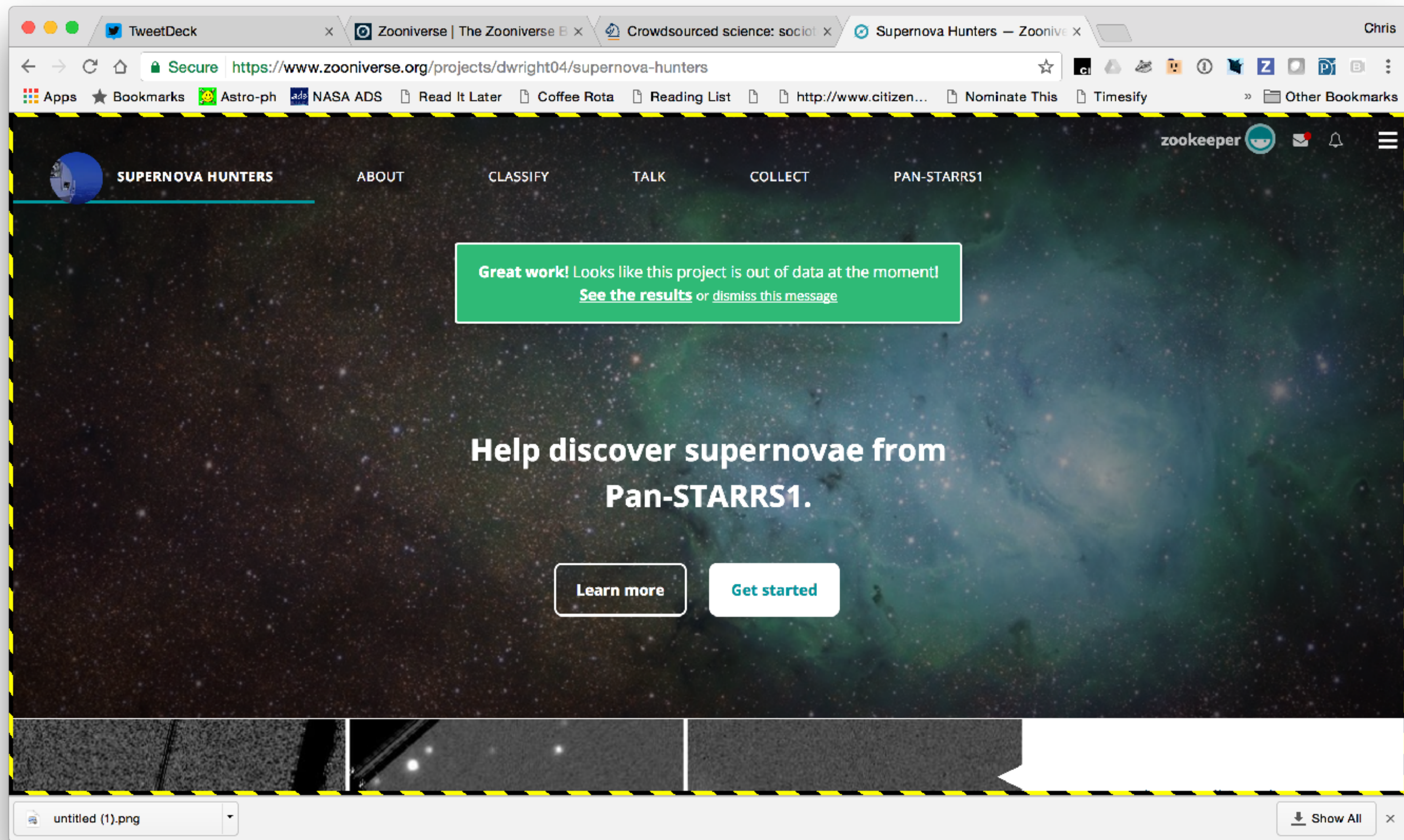
Not circular - diffuse

github.com/zooniverse/panoptes

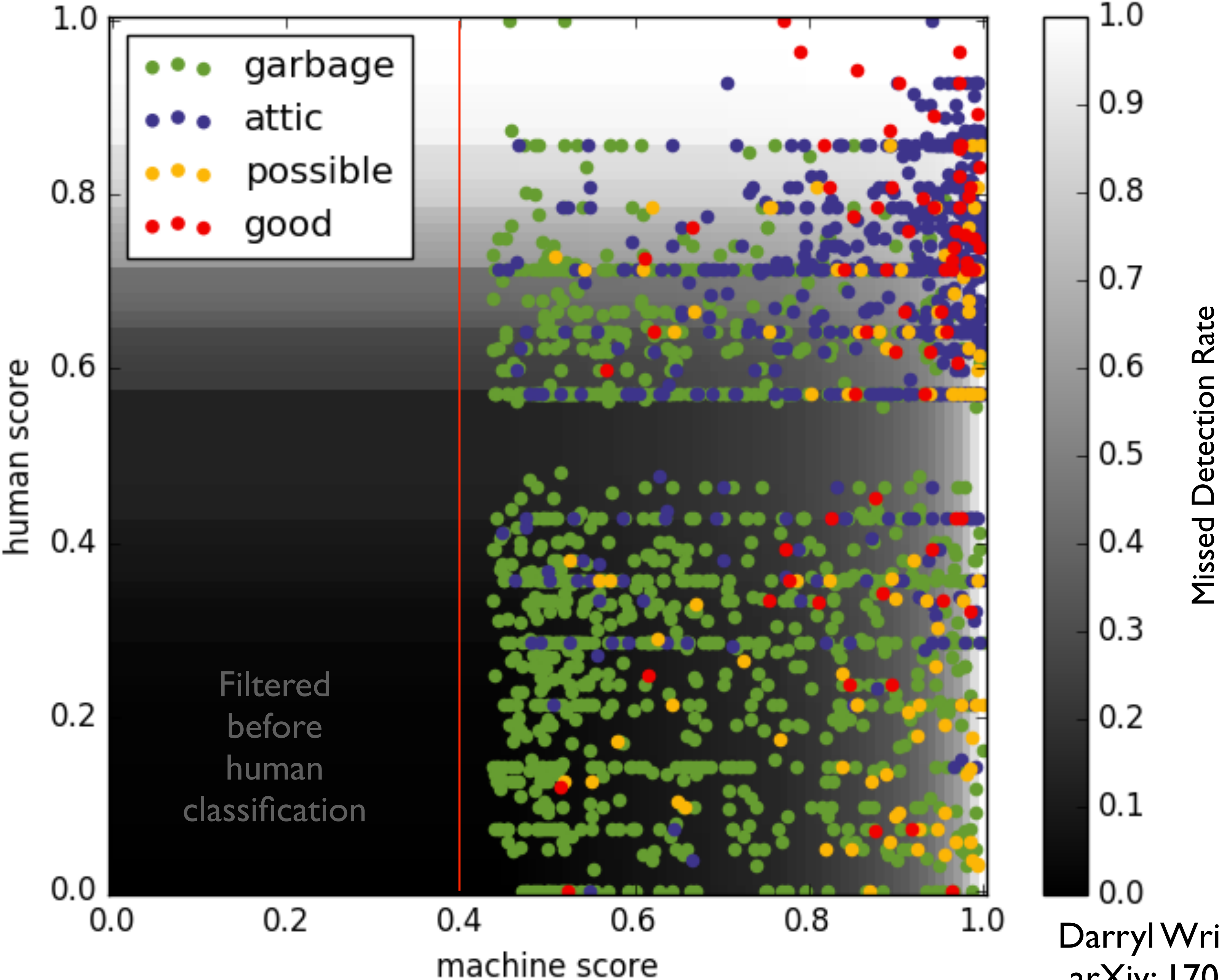
github.com/zooniverse/panoptes-front-end

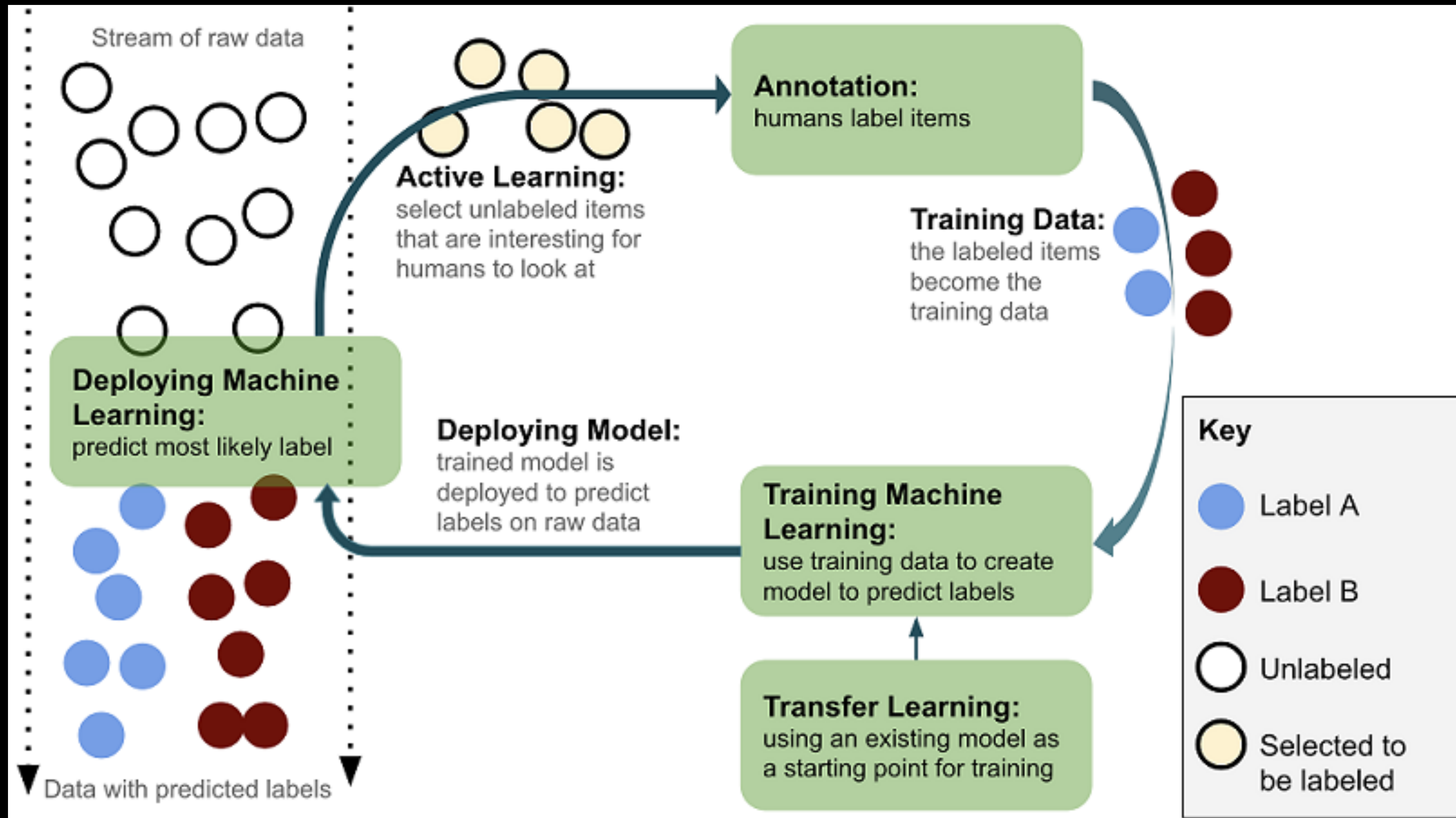


Zoobot by Emily Carrington Freeman
emilycarringtonfreeman.com



Pan-STARRS Supernovae





Human in the Loop Machine Learning
Monarch, Manning Publications (2021)



GALAXY ZOO.org

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Galaxy Analysis

Welcome to Galaxy Zoo's view of the Universe. If you're here you should already have seen the [Tutorial](#), but feel free to go and remind yourself. There's no need to agonise for too long over any one image, just make your best guess in each case.



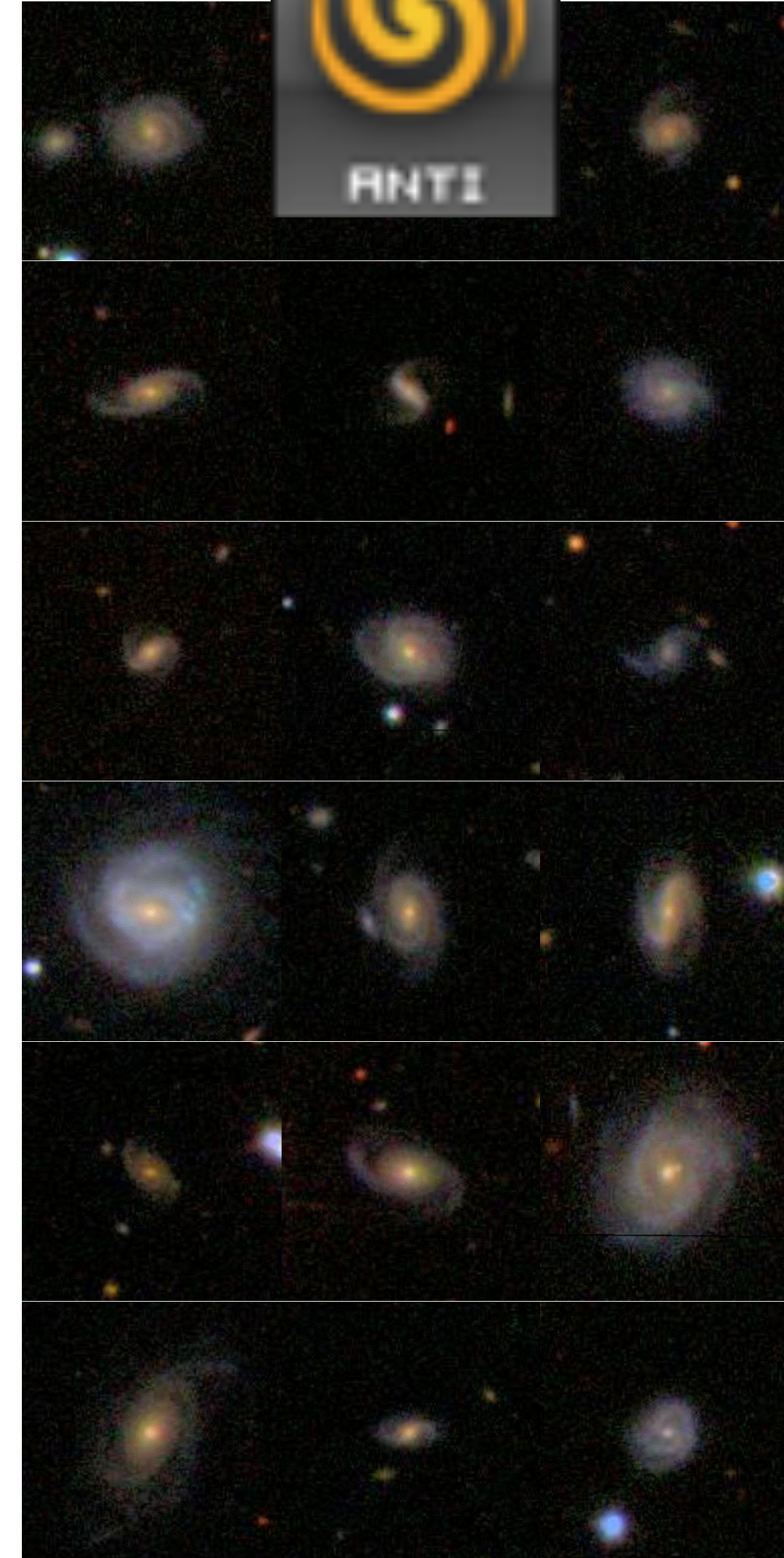
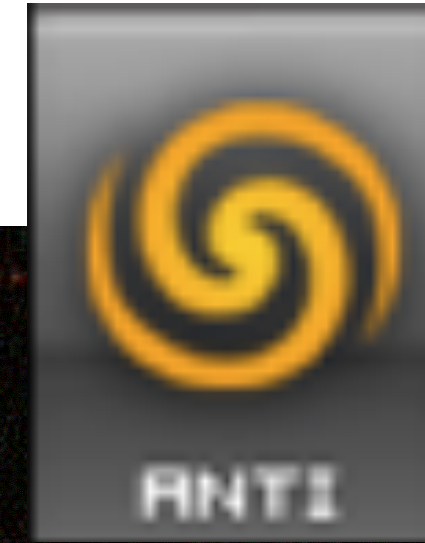
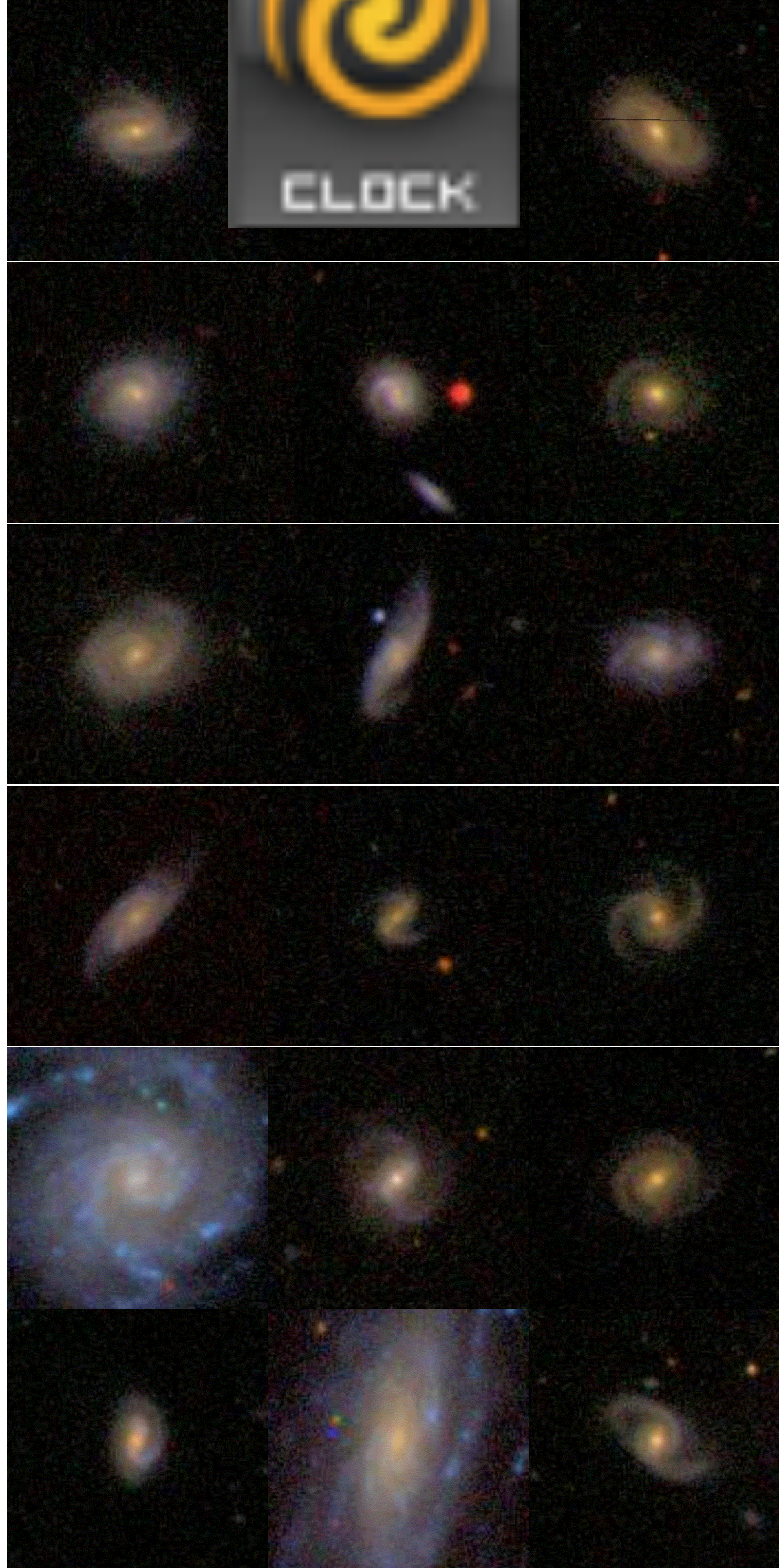
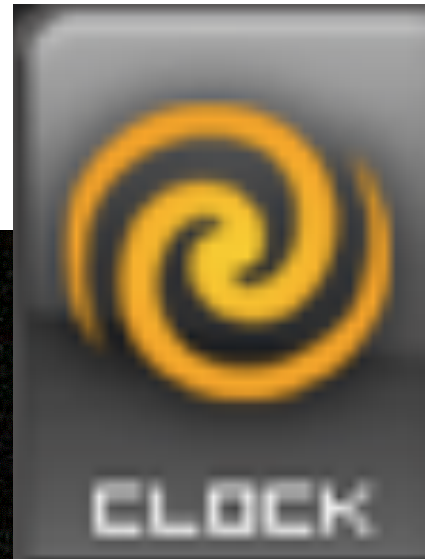
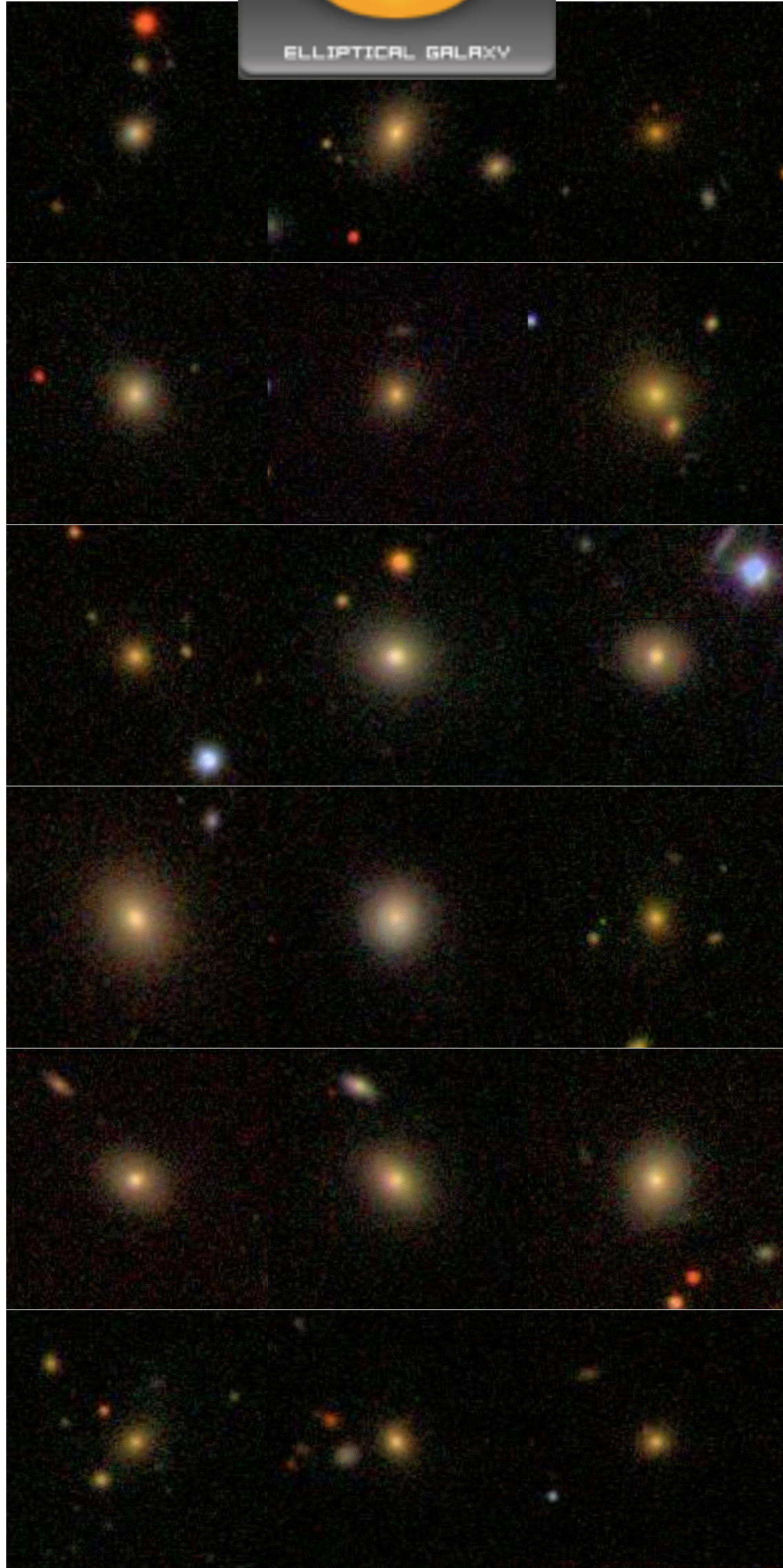
☐ Show Grid Overlay on the next Image

Galaxy Ref:

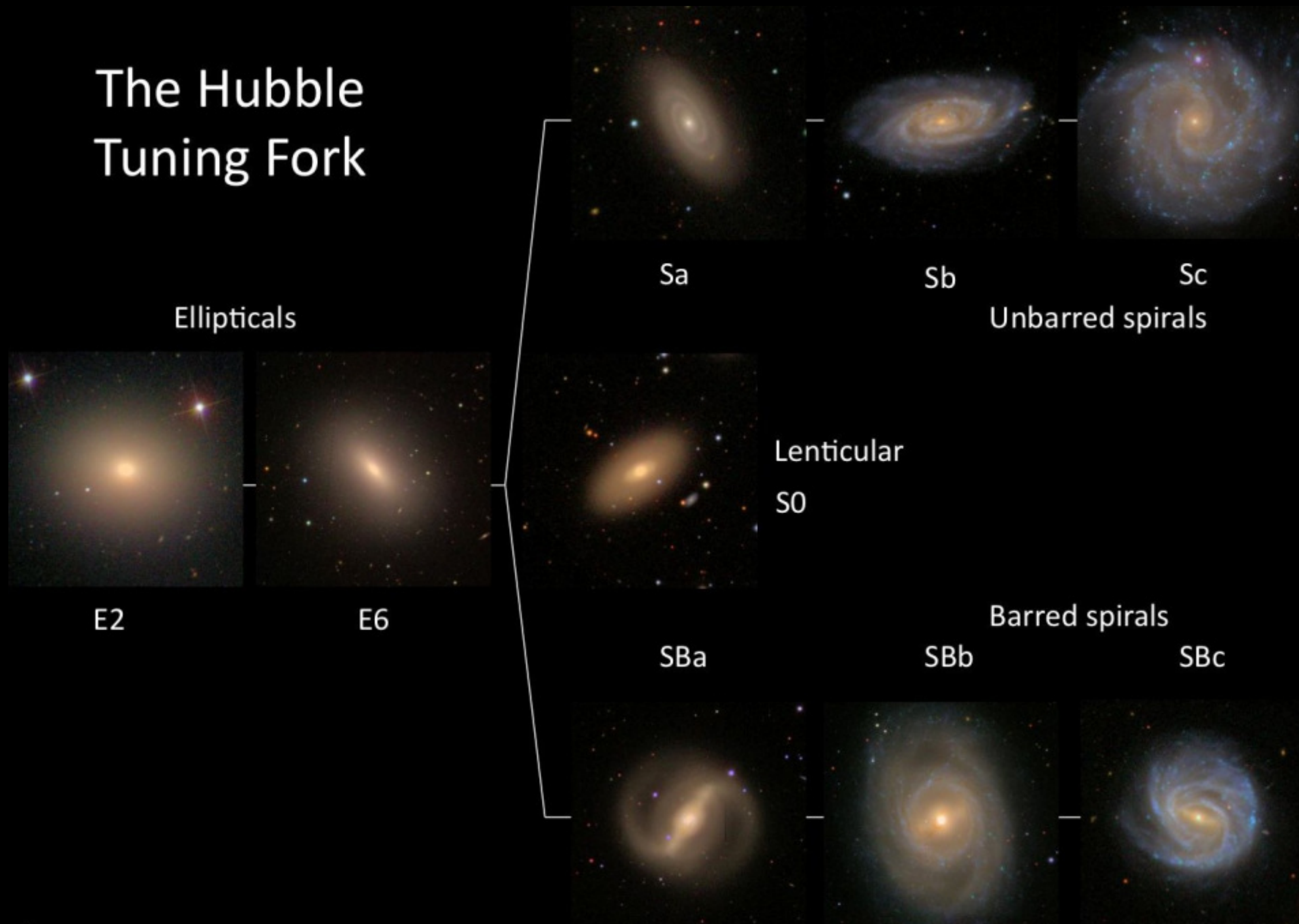
588010880371851294

Choose the Galaxy Profile
by clicking the buttons
below



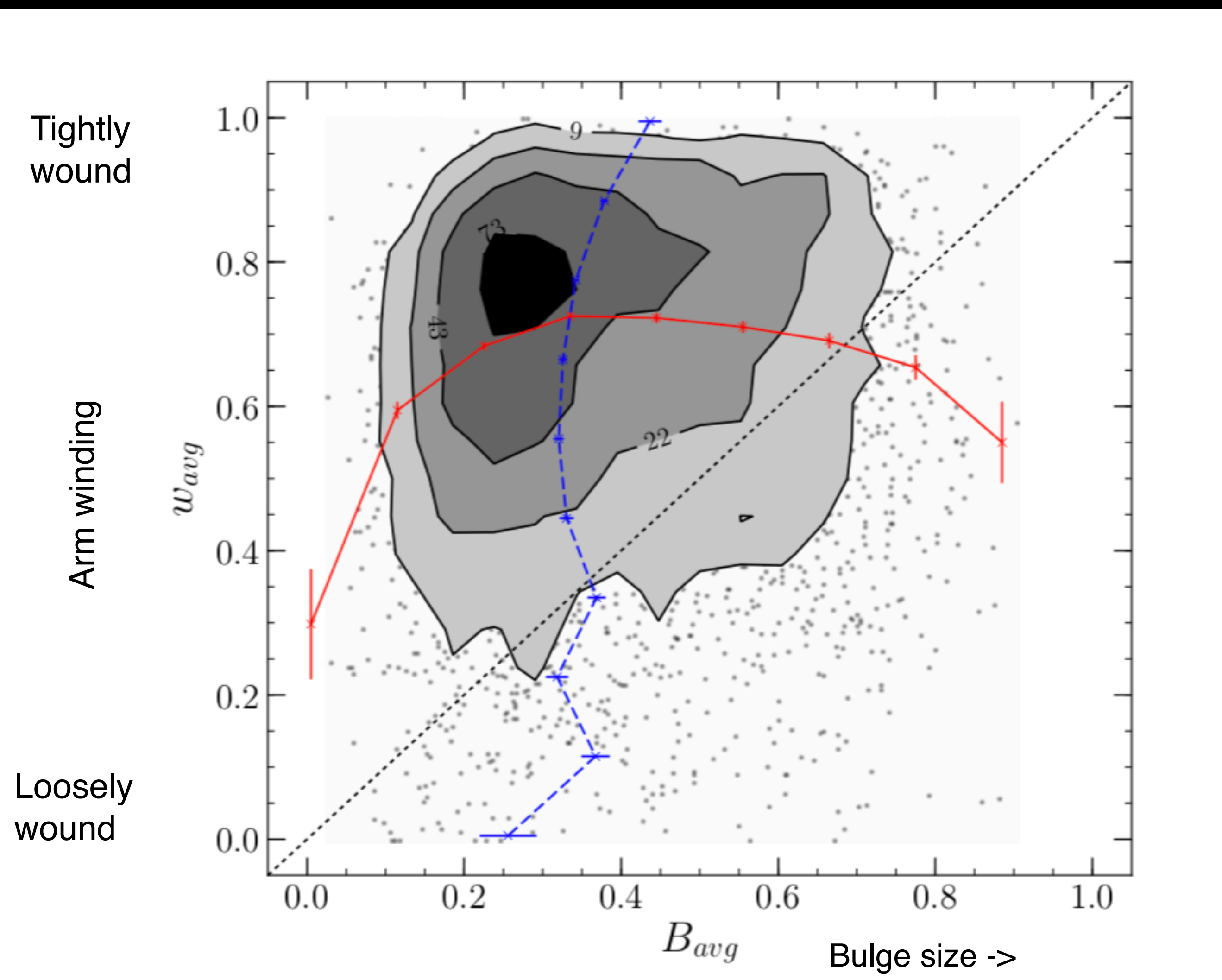


The Hubble Tuning Fork

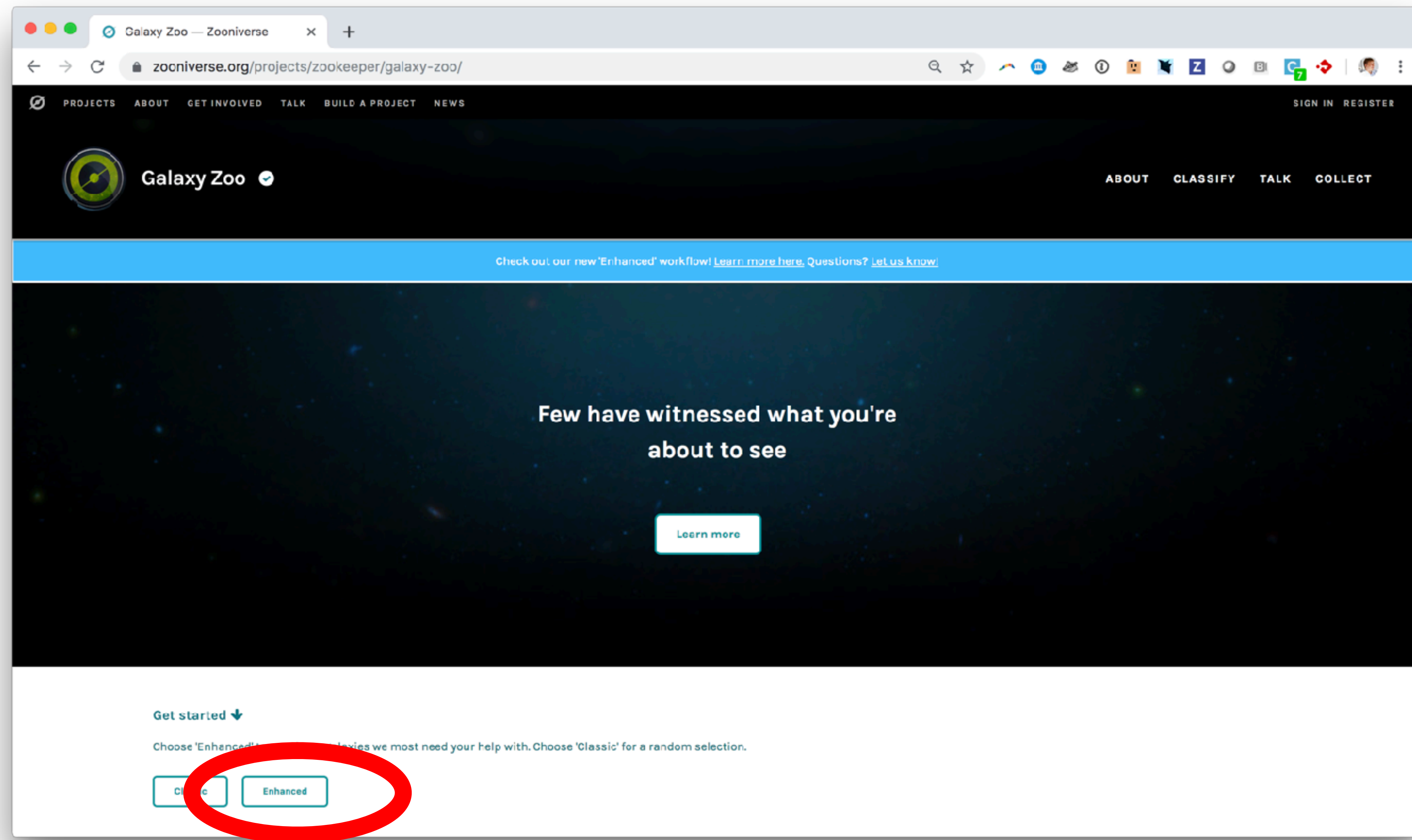


Spirals in Galaxy Zoo

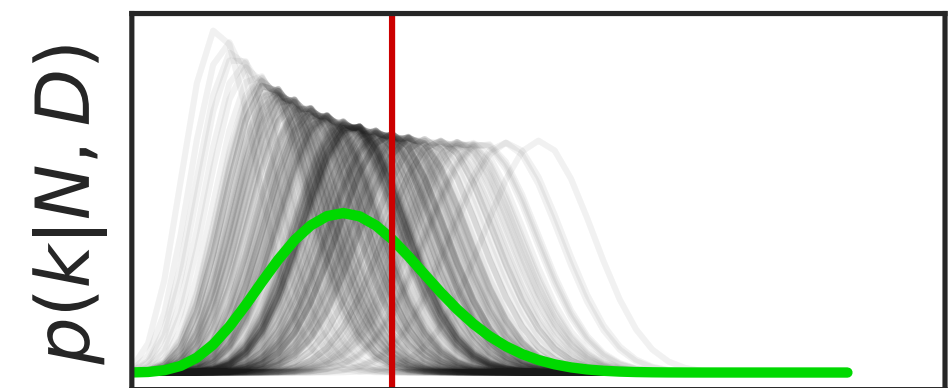
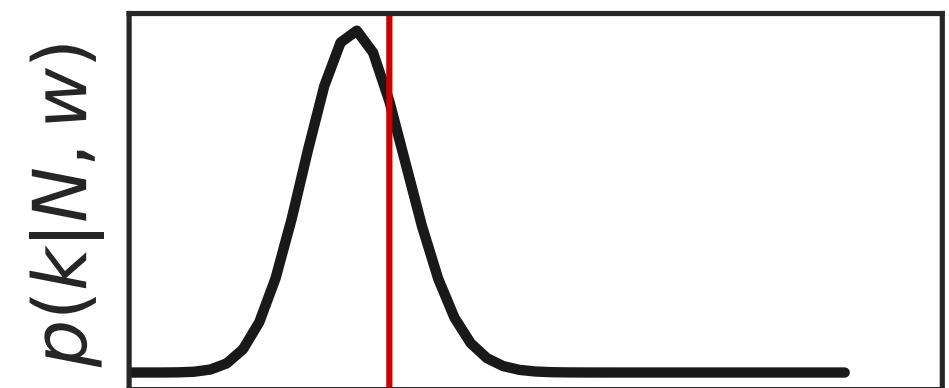
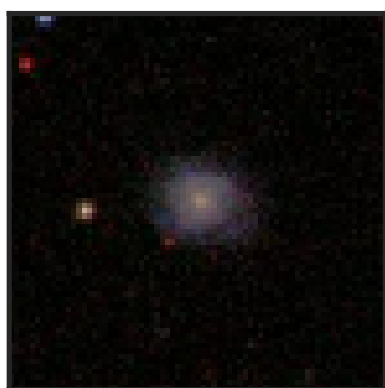
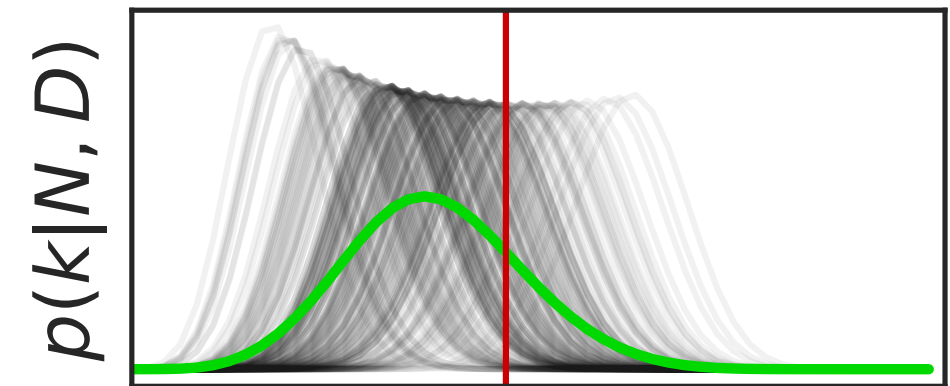
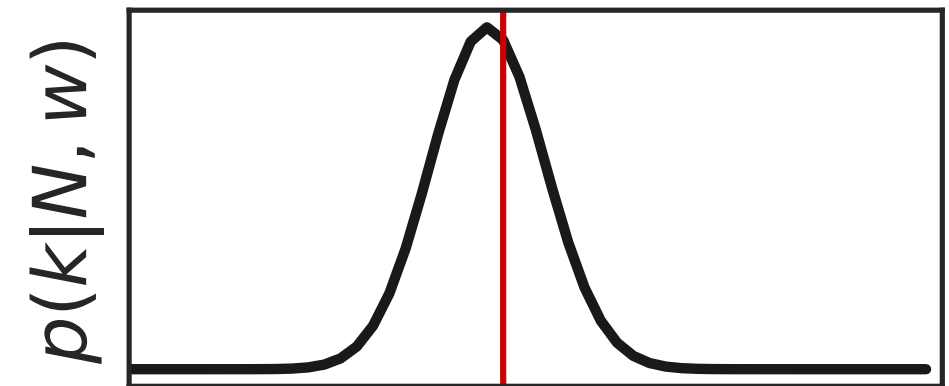
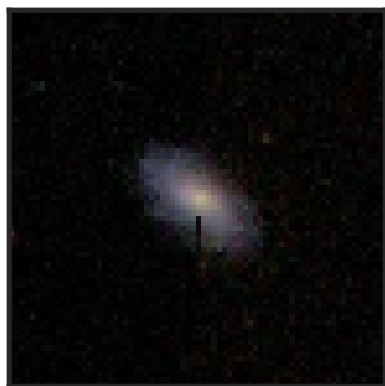
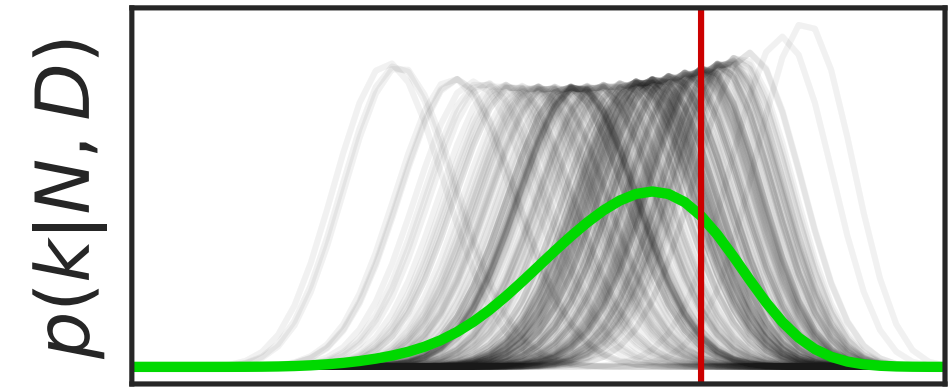
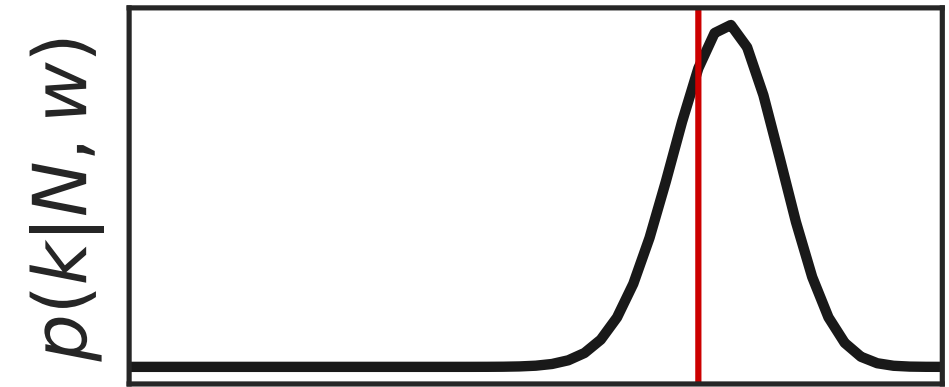
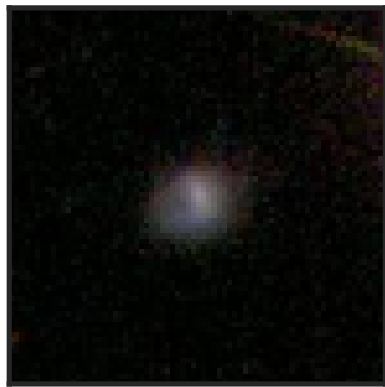
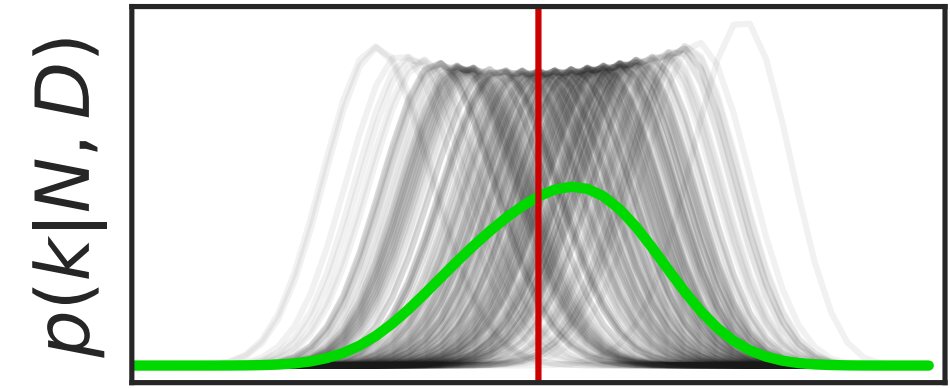
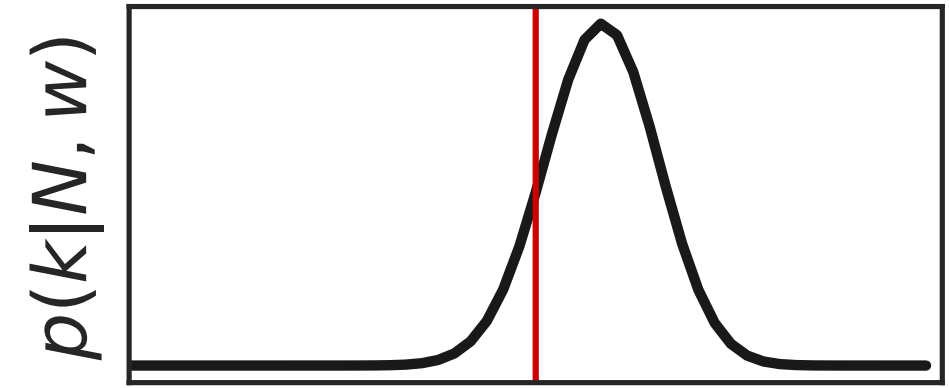
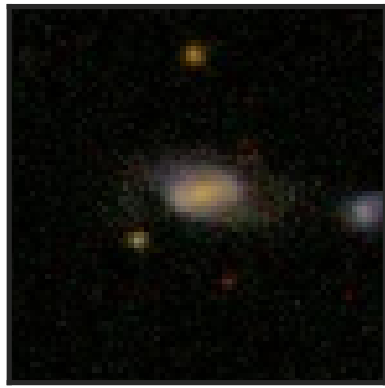
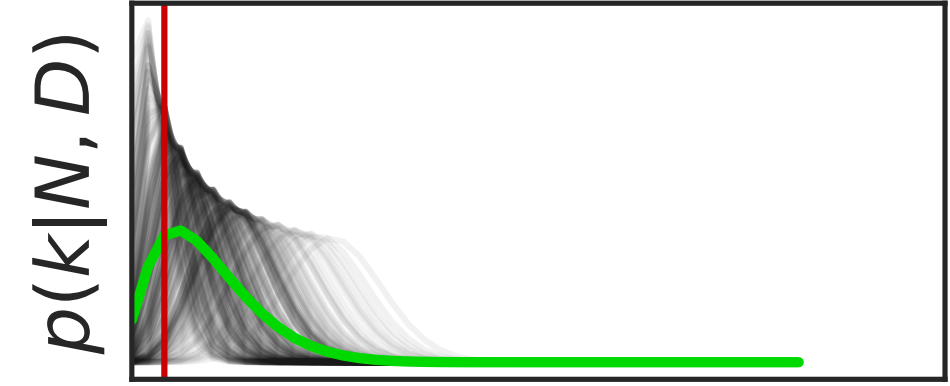
Masters et al. (2019), also see Hart et al. (2017, 2018a,b), Willett et al. 2015

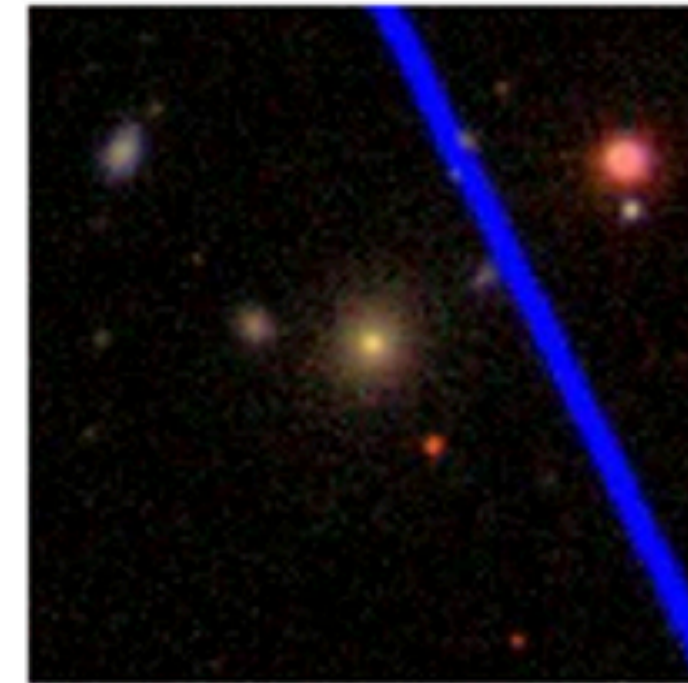
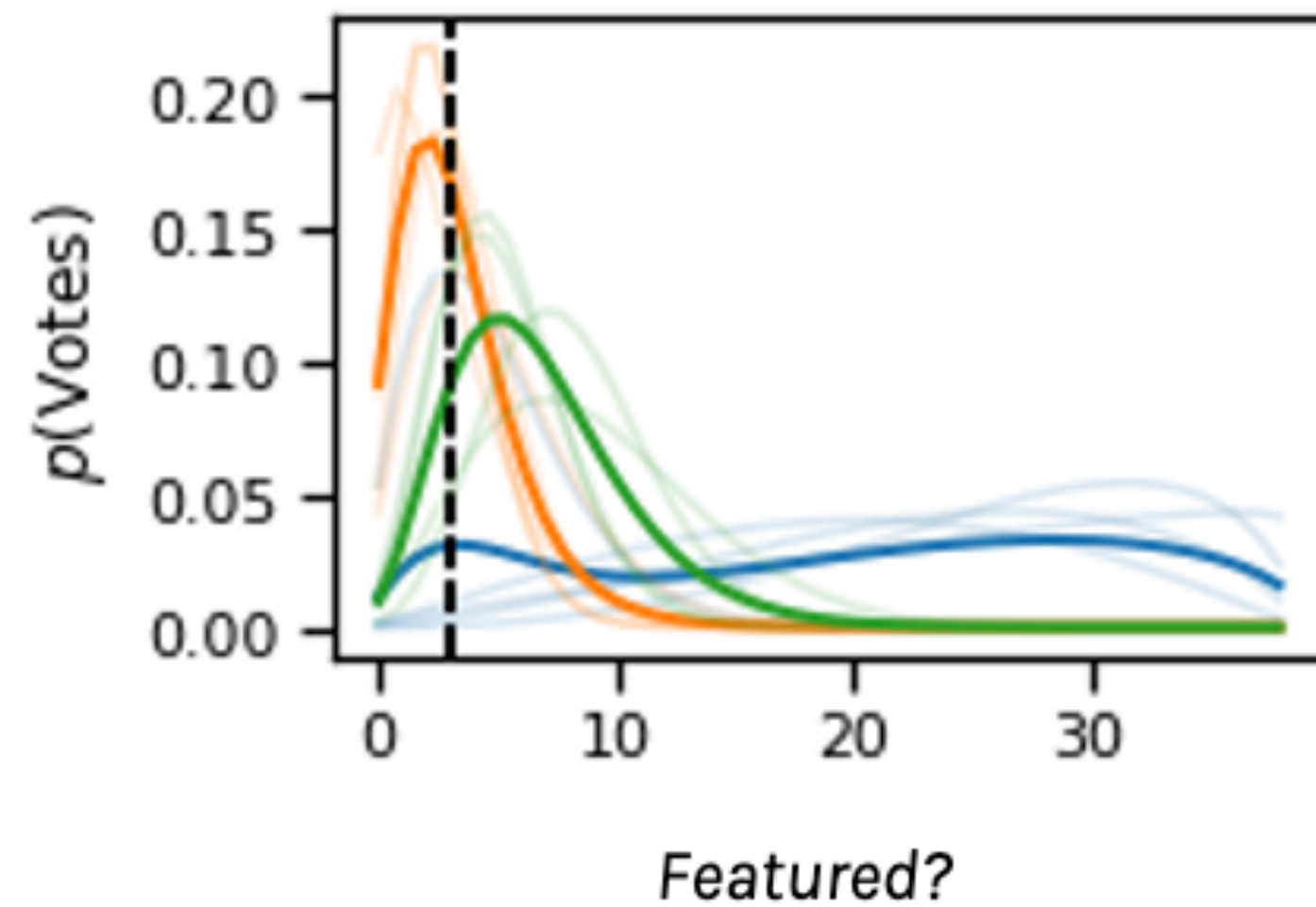


Sample: 4830
spirals
volume limited:
 $z < 0.035$
 $M_r < -19$
 $M_{\star} > \sim 10^9 M_{\odot}$



Now Deployed!





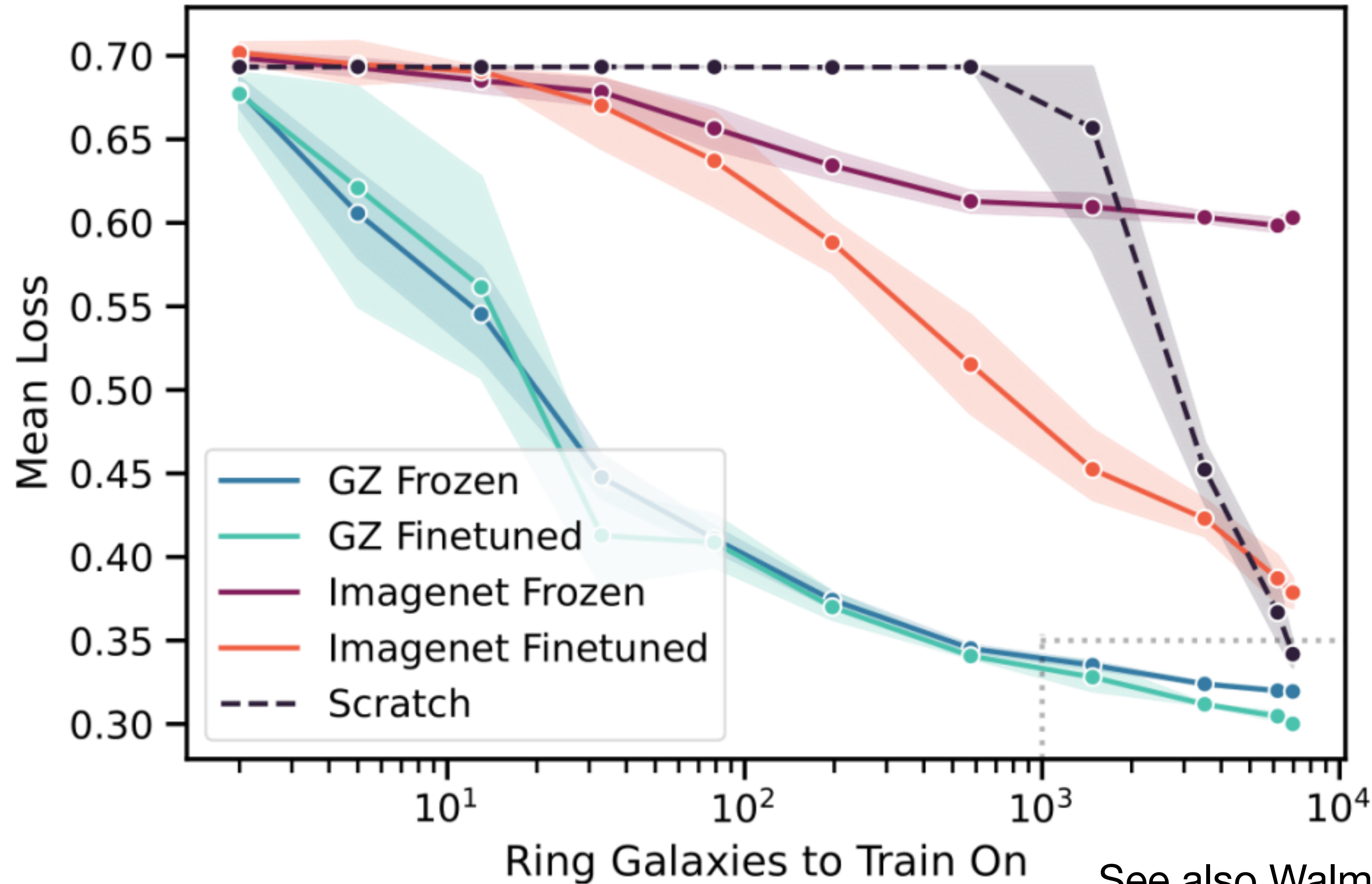
Pick galaxies where the models **confidently** disagree.

$$I = - \int H[p(k|w)] p(w|D) dw + H \left[\int p(k|w) p(w|D) dw \right]$$

Each model is
confident...

...but they give different
answers

Mutual Information I
Entropy H
Votes k
Weights w
Training data D



Galaxy Zoo Labels



Featured: 7 of 10
Spiral: 5 of 7
Bar: 2 of 7
etc.

Supervised Representation

[0.21, 0.32, 0.41...0.02]

Fine-tuning
Similarity Search
Anomaly Detection

Galaxy Zoo
Classifications

Similarity Search: tinyurl.com/ZooBotSimilarity

Mike Walmsley (Toronto)

RA (deg) ?

124.417040

Dec (deg) ?

4.497872

Search

Important Notes +

Closest Galaxy



RA: 124.41704. Dec: 4.49787. [Search Vizier](#)

Similar Galaxies

Show table +



RA (deg) ?

180.431121

Dec (deg) ?

0.183135

Search

Important Notes +

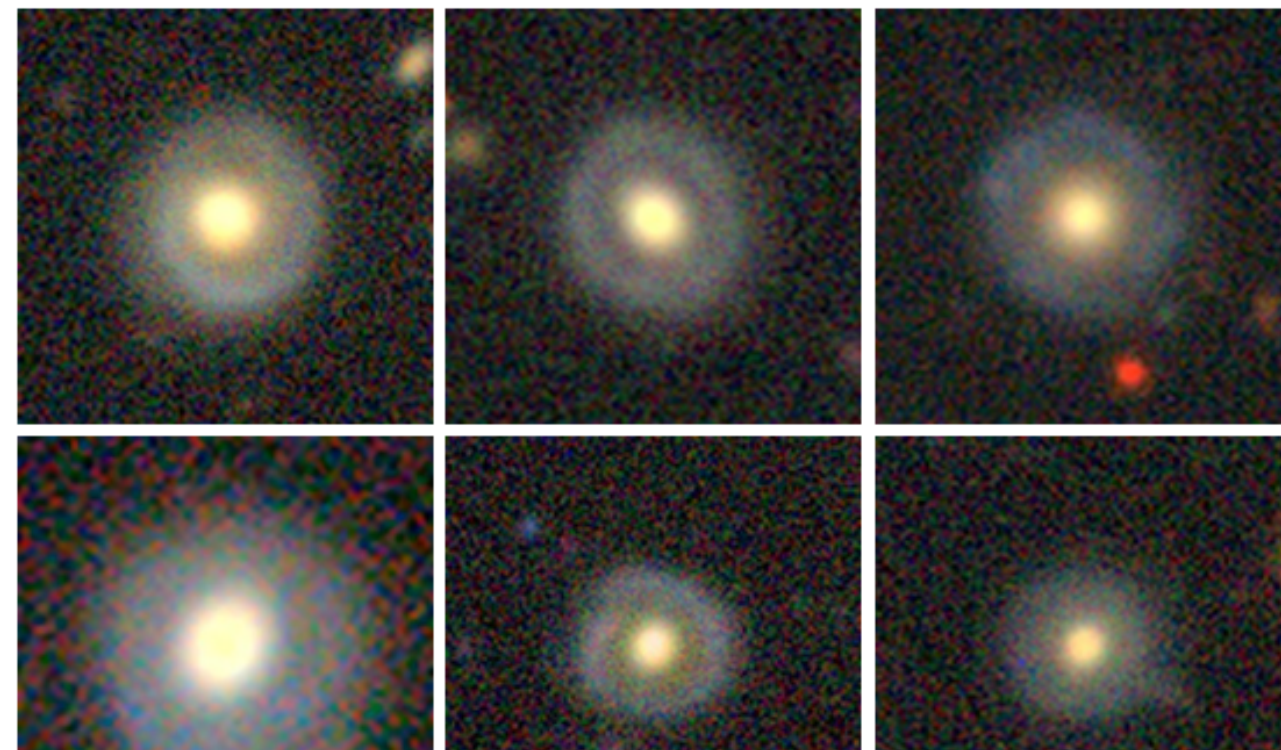
Closest Galaxy



RA: 180.43112. Dec: 0.18313. [Search Vizier](#)

Similar Galaxies

Show table +

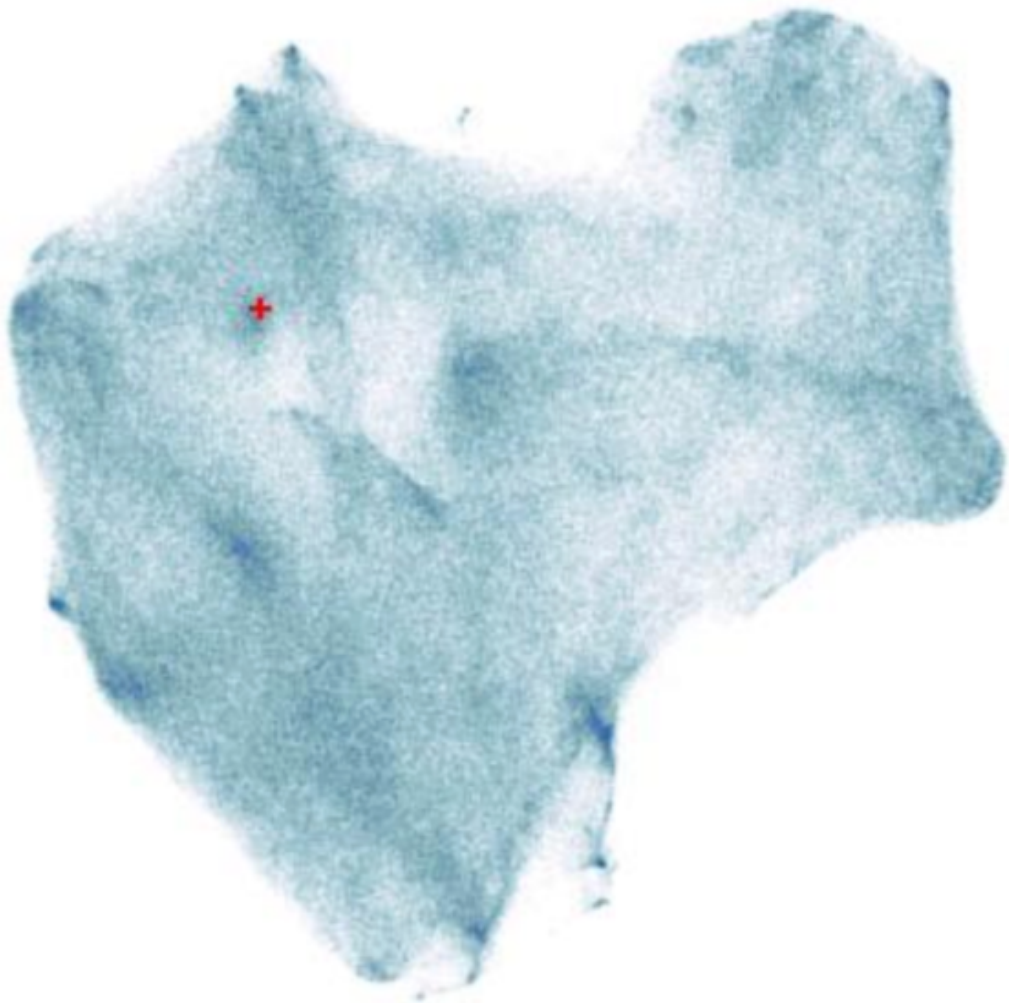


Move Around

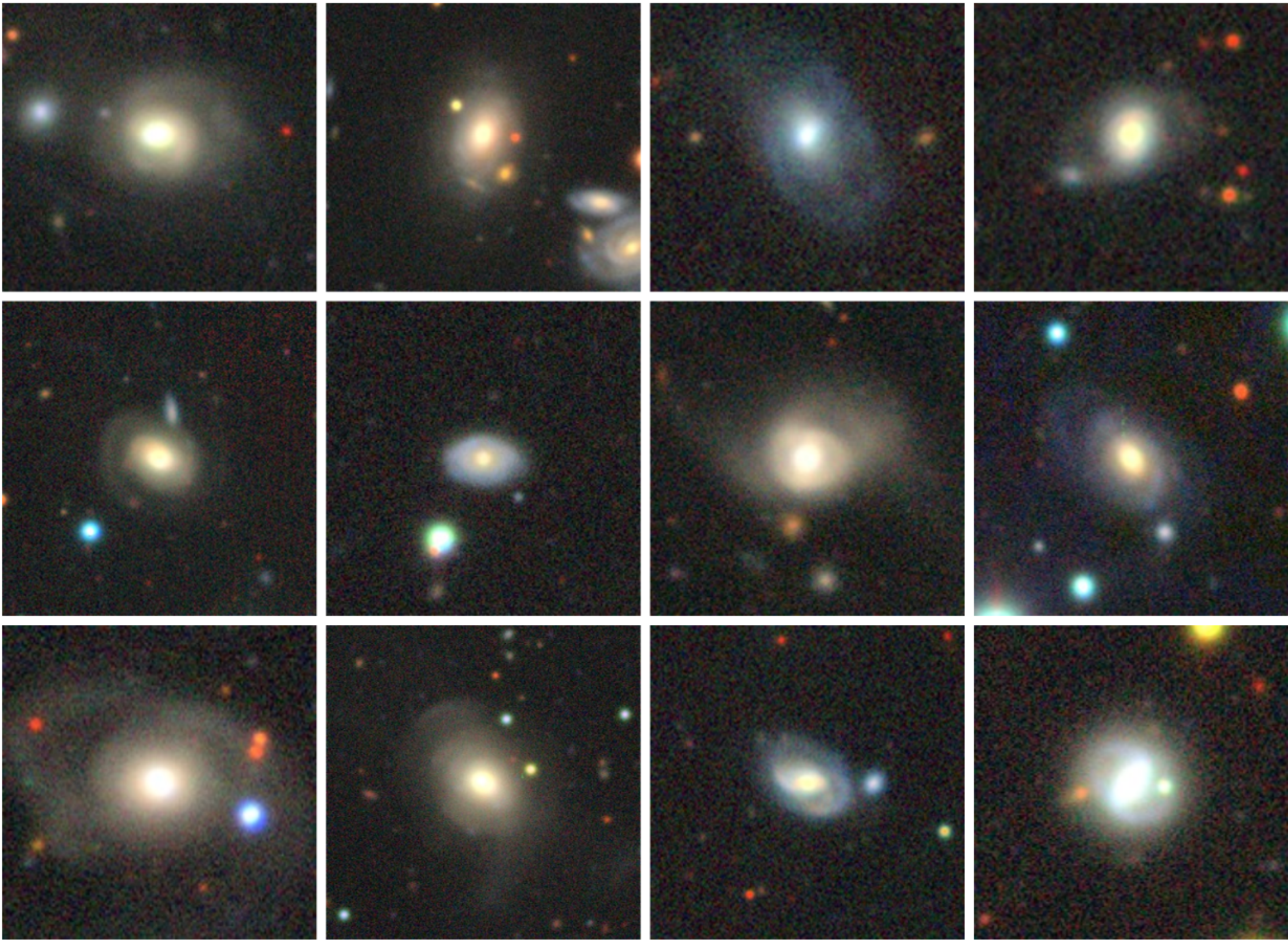
Click anywhere on the latent space to view galaxies.

Select Reduction

Featured v2



Location: (-0.109, 6.410)



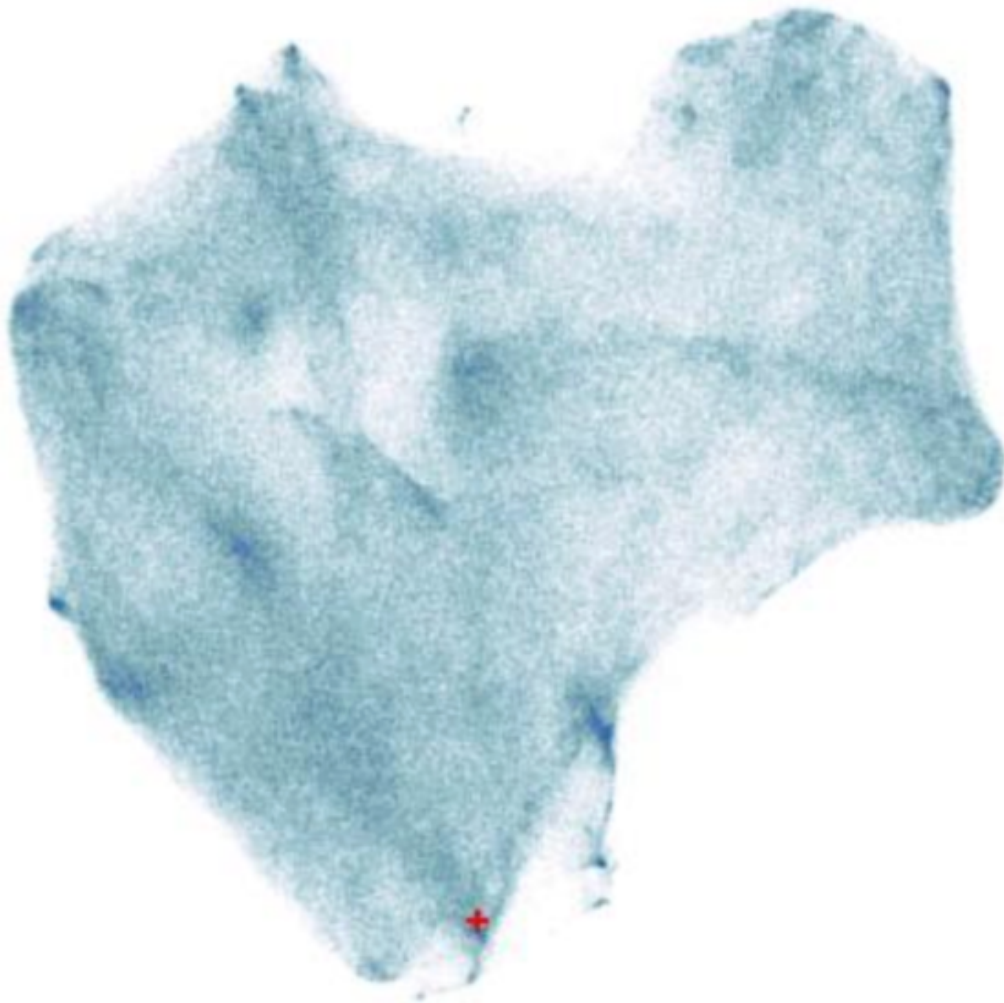
Download CSV of the 1000 galaxies closest to your search

Move Around

Click anywhere on the latent space to view galaxies.

Select Reduction

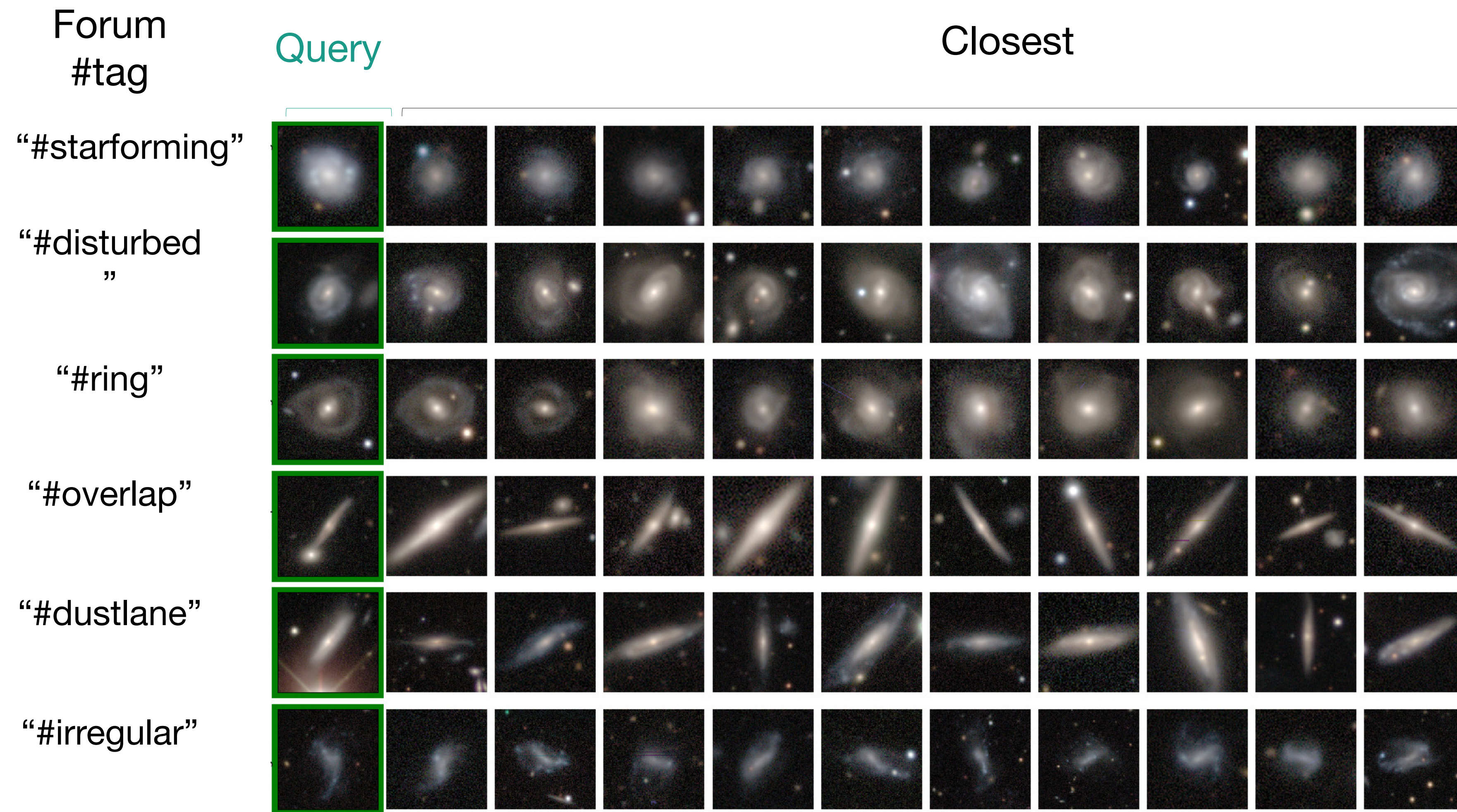
Featured v2

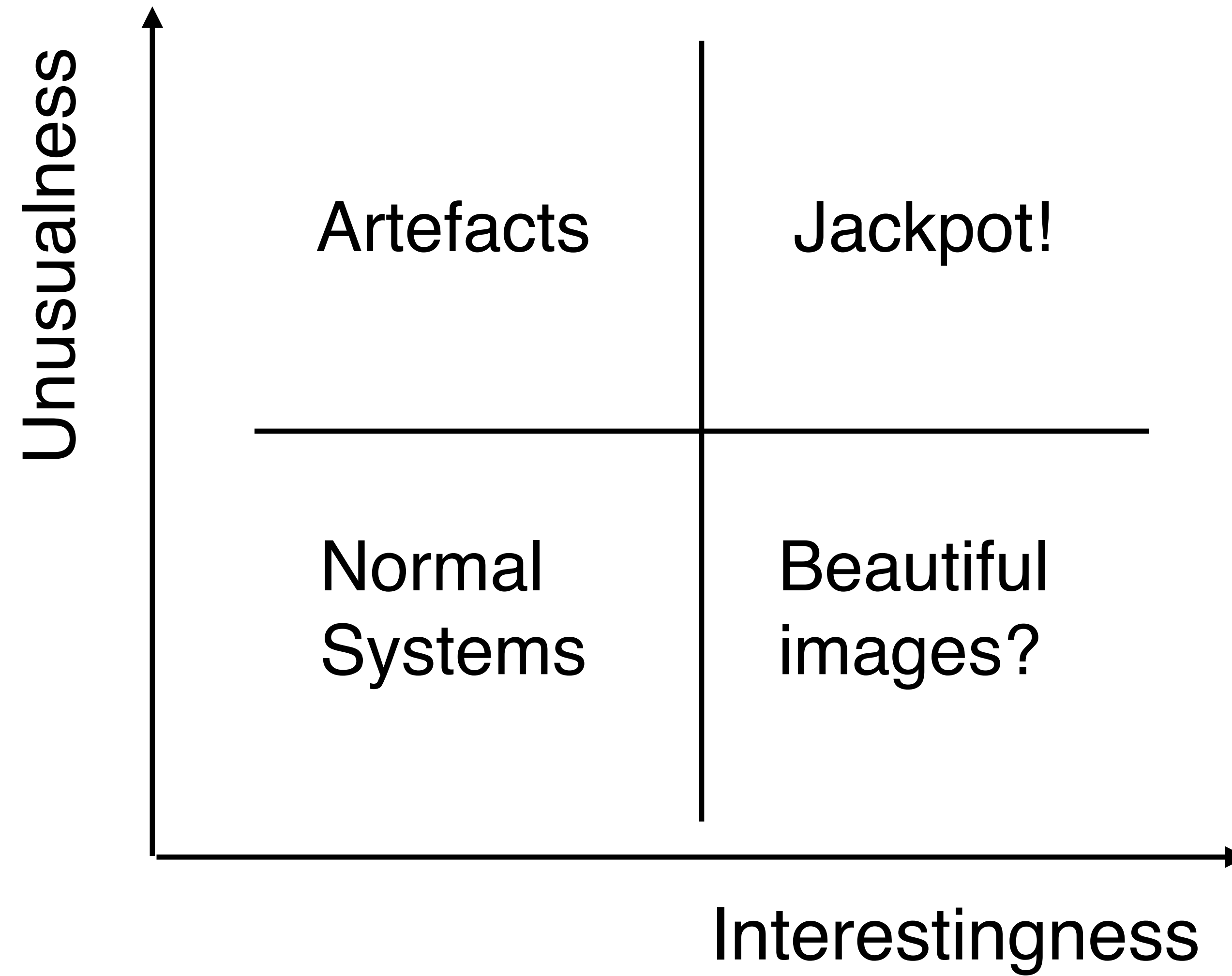


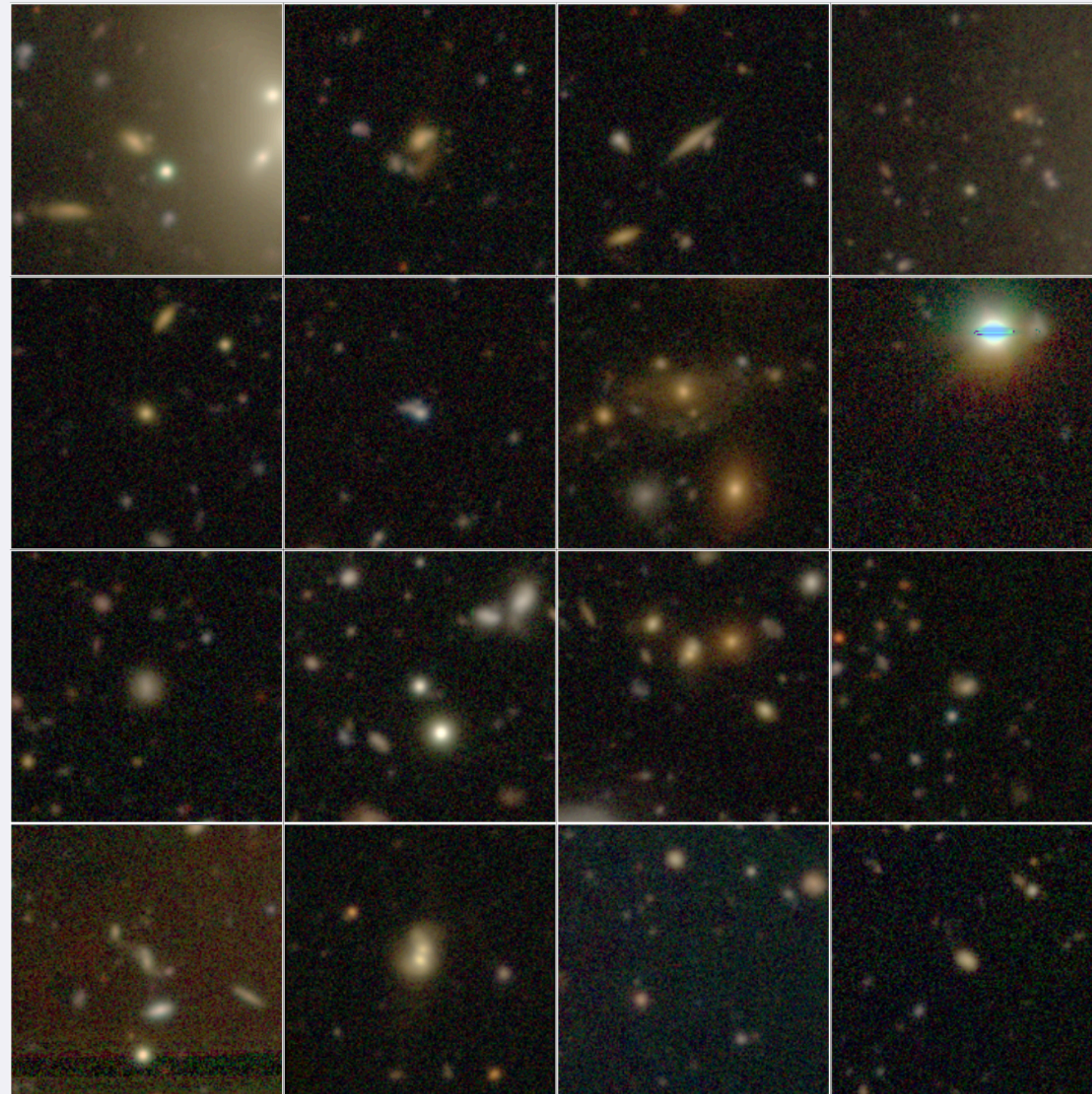
Location: (2.809, 0.812)



Download CSV of the 1000 galaxies closest to your search





FIELD
GUIDE

Done

○ SWITCH TO DARK THEME

 SUBJECT INFO  ADD TO FAVORITES  ADD TO COLLECTIONS

Galaxy Zoo: Weird and Wonderful

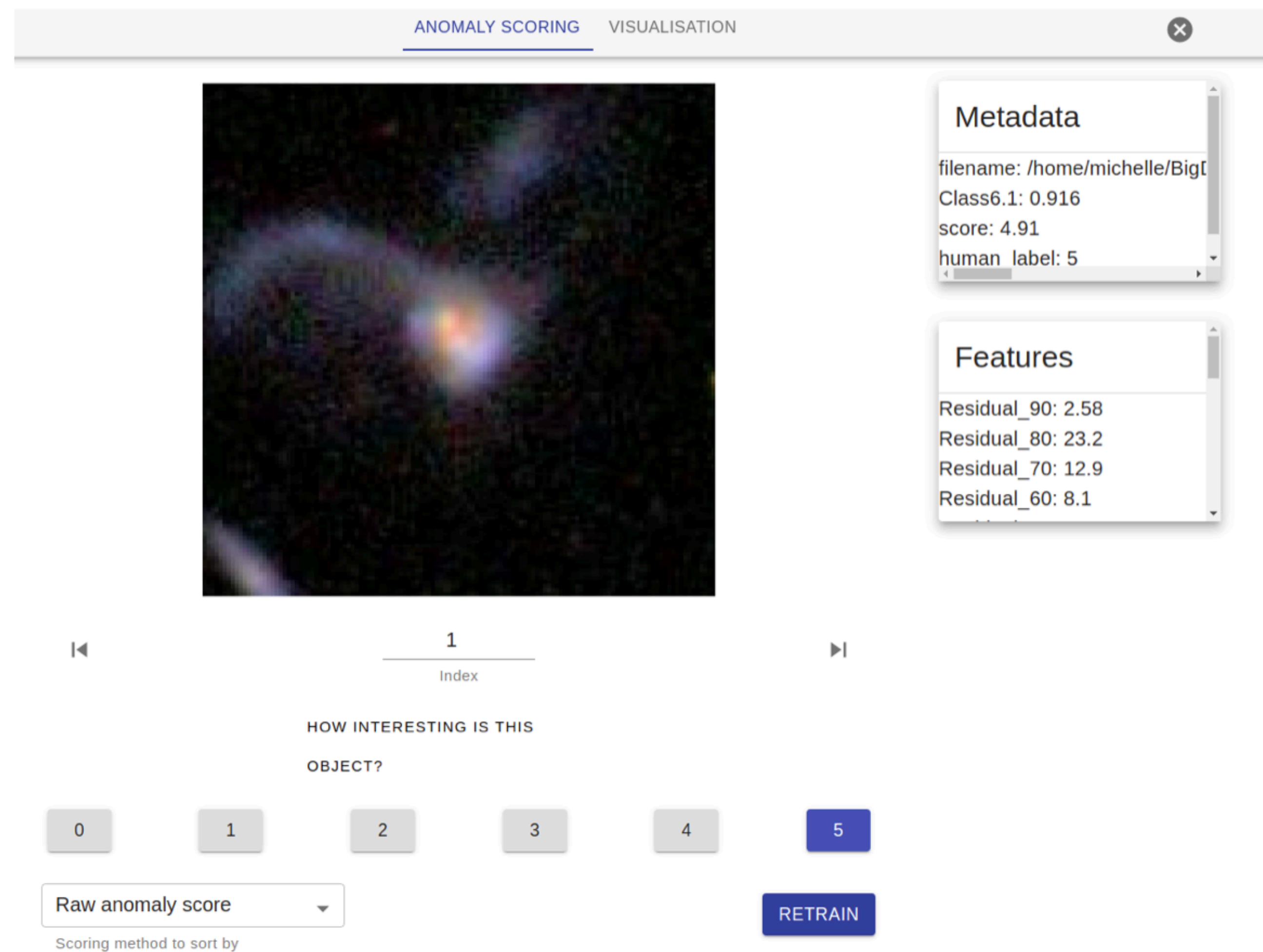
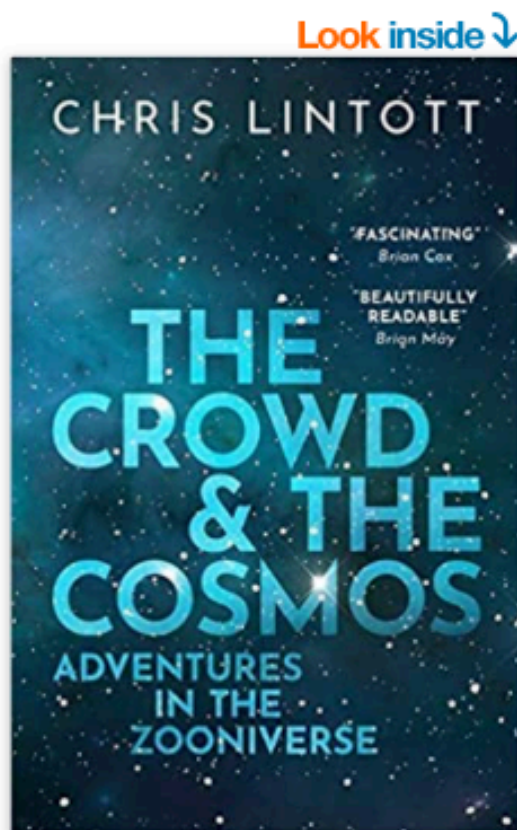


Figure 2: A screenshot of the ASTRONOMY visual interface with a Galaxy Zoo example. This interface is used to quickly scroll through the most anomalous objects labelling them according to relevance.



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Lintott, Chris

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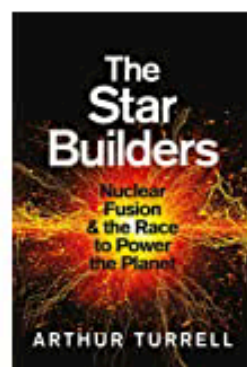
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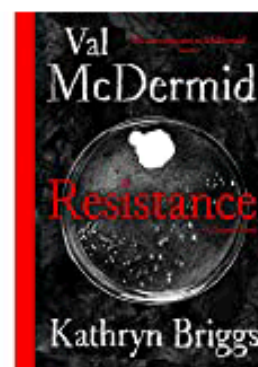
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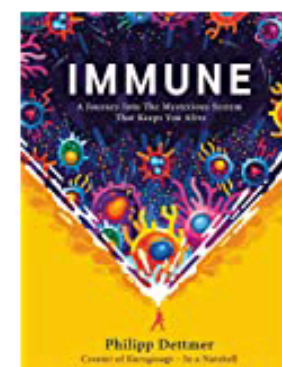
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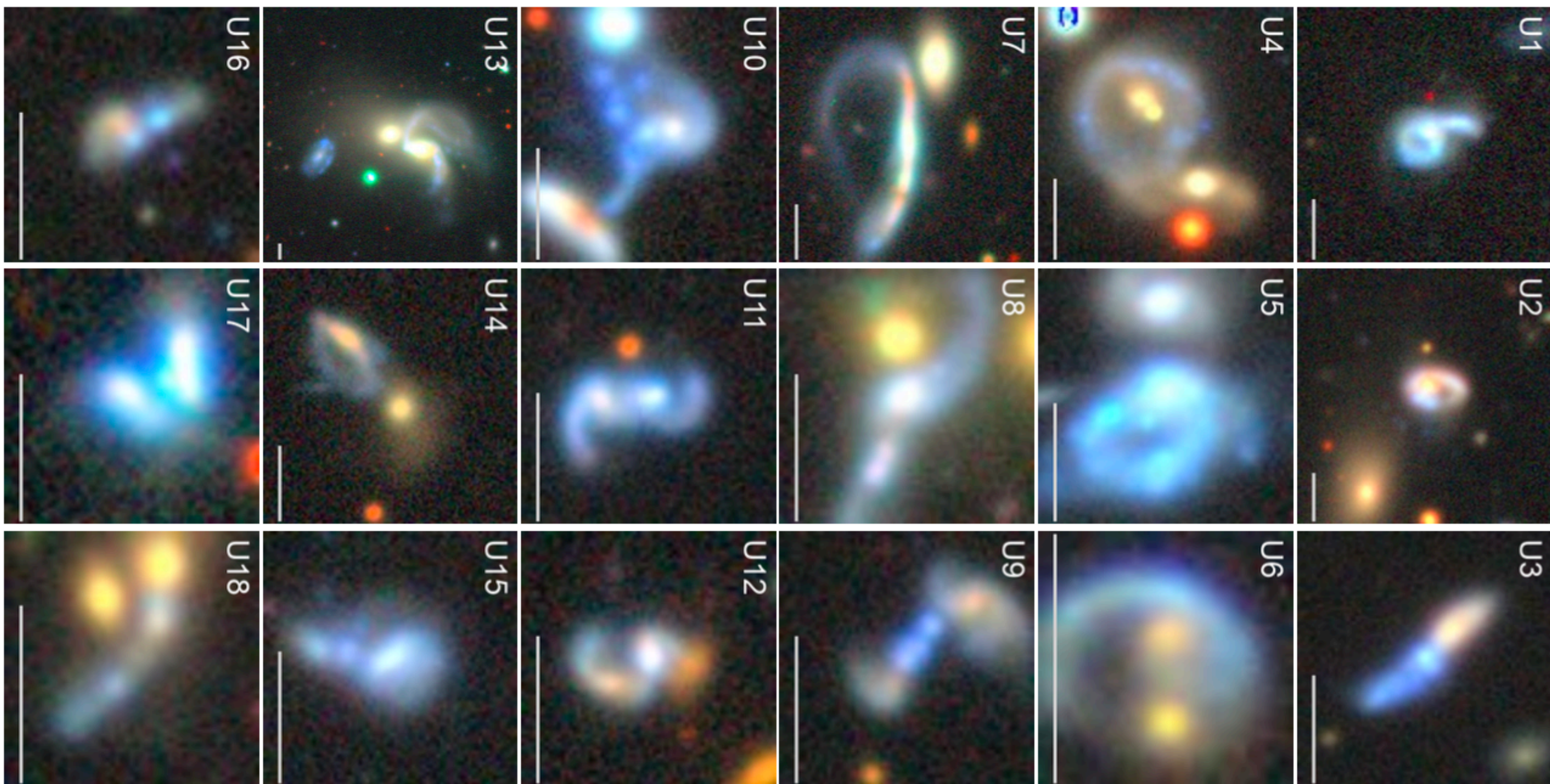
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