Citizen Scientists Discover Extremely Cold Brown Dwarfs

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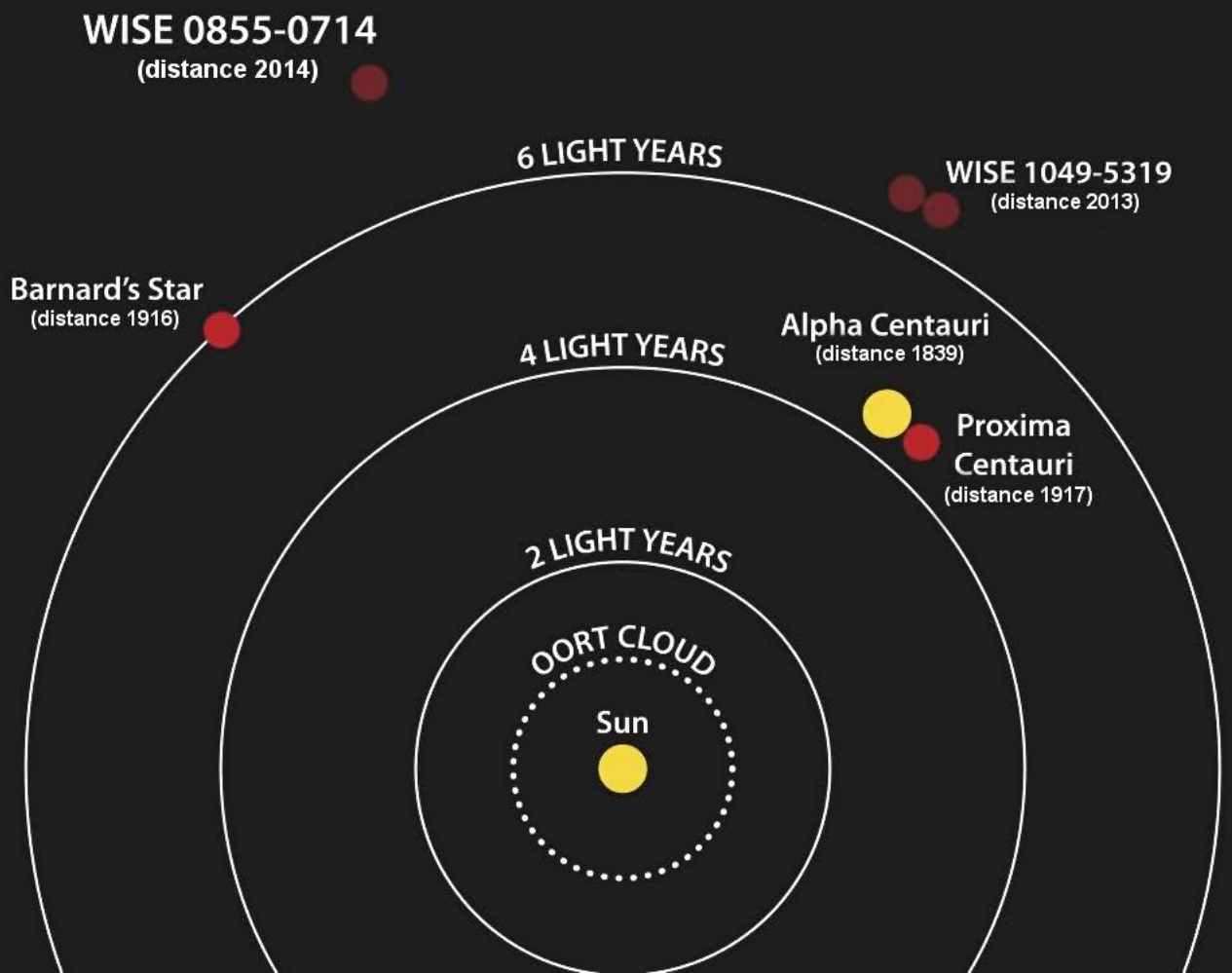
Backyard Worlds: Planet 9 Collaboration

CatWISE Team

NOIRLab/NSF/AURA/P. Marenfeld

The time-honored quest to find our Sun's closest neighbors



NASA/Penn State University

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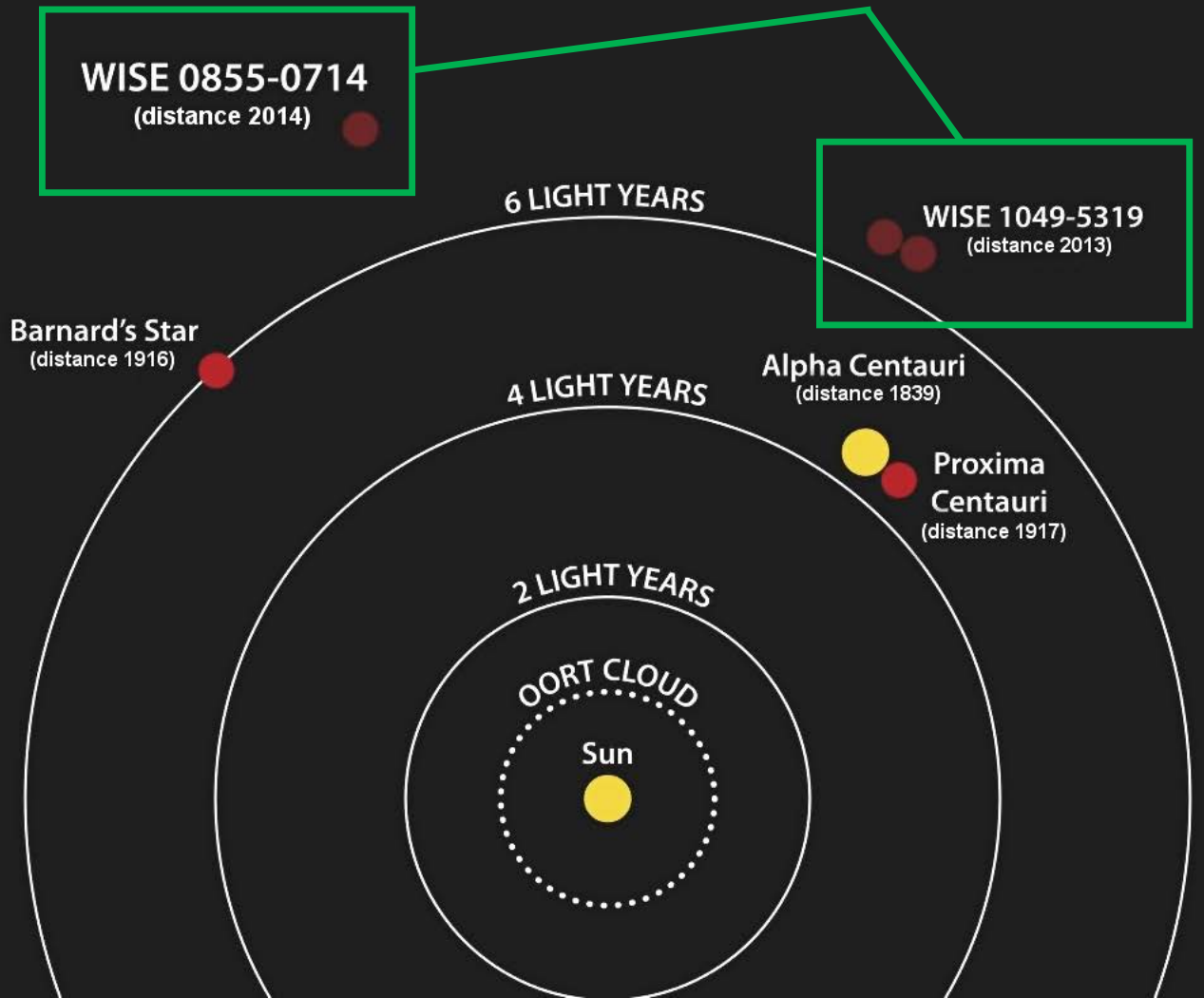
The time-honored quest to find our Sun's closest neighbors

discovered recently by NASA's
Wide-field Infrared Survey Explorer (WISE) mission



NASA/Penn State University

NOIR Lab

DESI imaging processed a quarter petabyte of raw WISE data to create the deepest, most comprehensive all-sky infrared maps

Wide-field Infrared Survey Explorer

NASA UCLA JPL Ball ipac

NOIR Lab

the Backyard Worlds: Planet 9 citizen science project

- Launched in February 2017 via Zooniverse
- More than 7 million user ‘classifications’
- Over 64,000 registered users
- Roughly 150,000 unique contributors
- Participants from all 50 states, plus Puerto Rico and DC
- 167 countries represented

today’s news: best ever 3D map of brown dwarfs in the Sun’s cosmic neighborhood

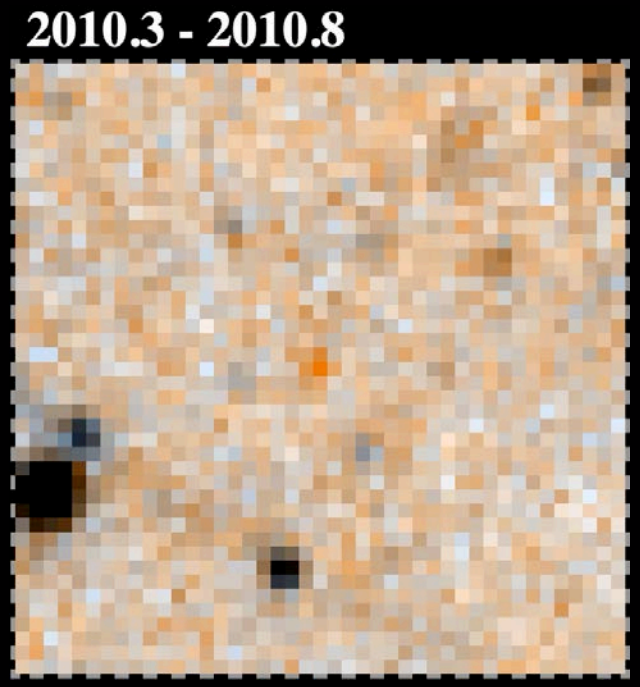
Lead author: J. Davy Kirkpatrick (Caltech/IPAC)

Video: Jackie Faherty (AMNH)/OpenSpace

3,000 Backyard Worlds brown dwarf discoveries: more than 2 per day!

Video: Jonathan Gagné (Rio Tinto Alcan Planetarium)

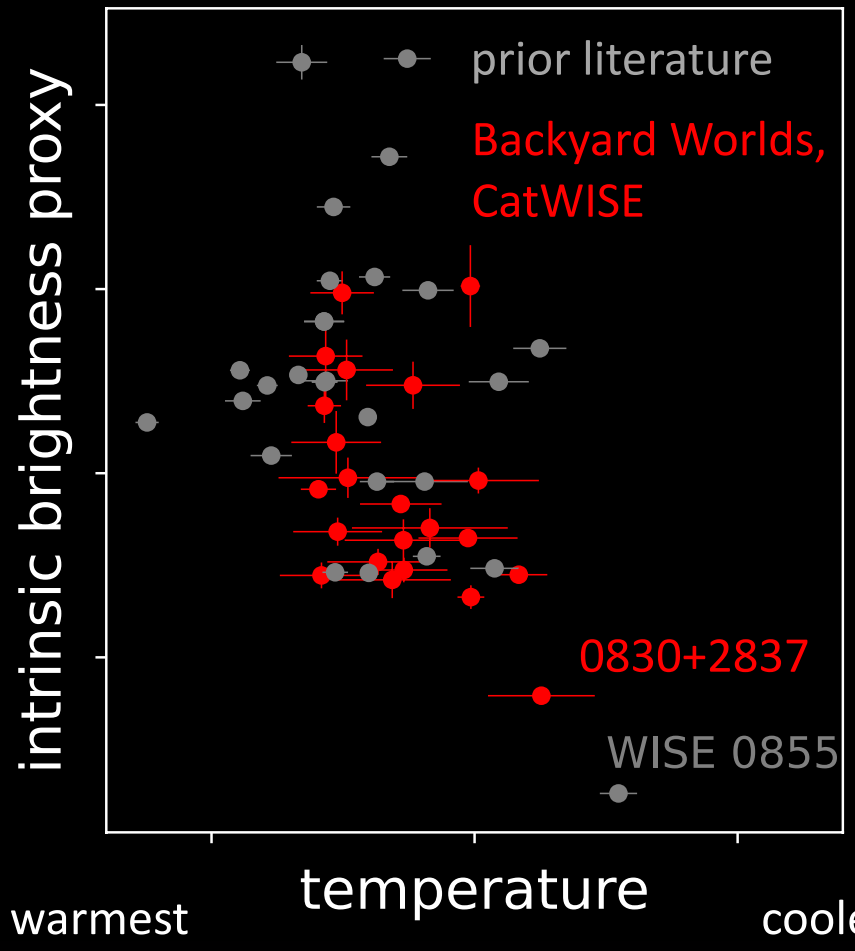
surprise: Sun's nearest neighbors even weirder than previously thought



WISE 0830+2837, discovered by Backyard Worlds citizen scientist Dan Caselden – the second coldest known brown dwarf?

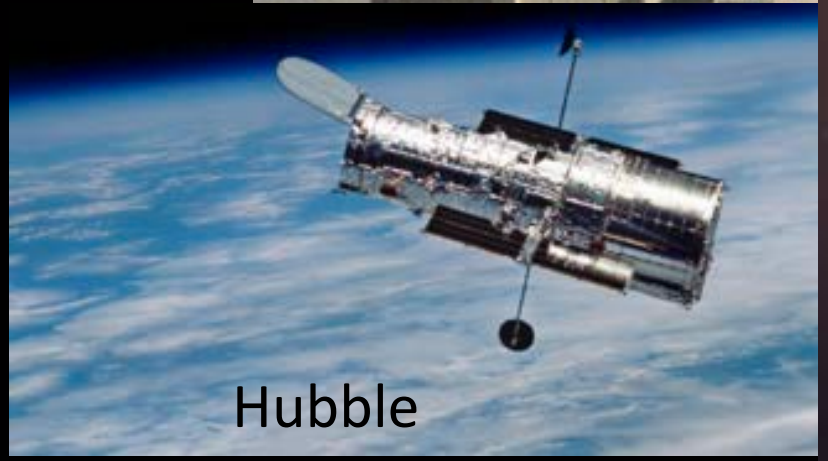
Bardalez Gagliuffi et al. (2020)

identified Y dwarfs ($T_{eff} \lesssim 450$ Kelvin)



WISE 0855, the coldest known brown dwarf, still stands alone!

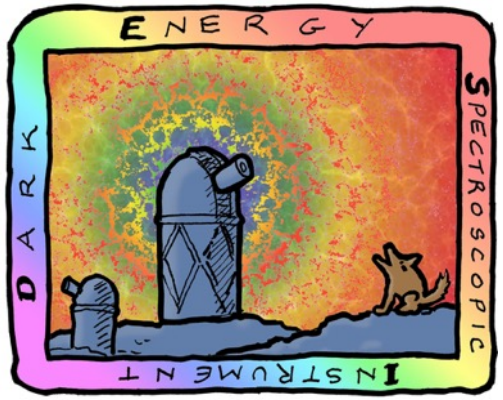
observing citizen scientist discoveries with premier telescopes

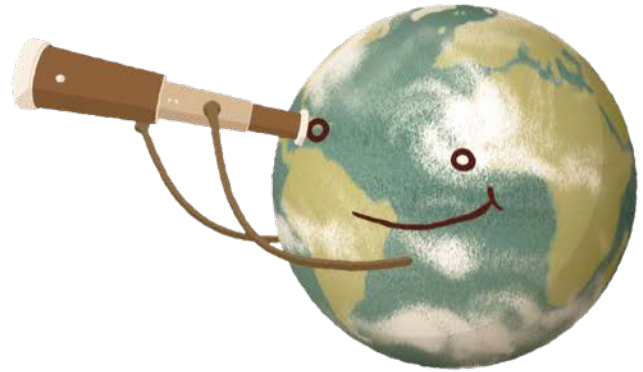


crucial distance estimates are based on Spitzer Space Telescope follow-up (Kirkpatrick et al., in press)

conclusion

- With help from DESI imaging sky maps and citizen scientists, we've published the best ever 3D census of nearby brown dwarfs.
- Our discoveries would not have been possible without WISE and DESI Legacy Surveys 'open data' practices.
- We could still use much more help from members of the public!





https://noirlab.edu/public/news/noirlab2105/
https://www.nasa.gov/feature/citizen-scientists-help-create-3d-map-of-cosmic-neighborhood

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