The Milky Way is not special: accreted stars also inhabit the Lithium Spite Plateau

Jeffrey Simpson (UNSW)
and the GALAH Collaboration

Read it all in Simpson *et al* (2021)

N3AS seminar • 13 September 2021

Read the paper

Galactic Archaeology:
How did our Milky Way Galaxy form, grow, and evolve?

Huge datasets: **GALAH**, *Gaia*

GALAH

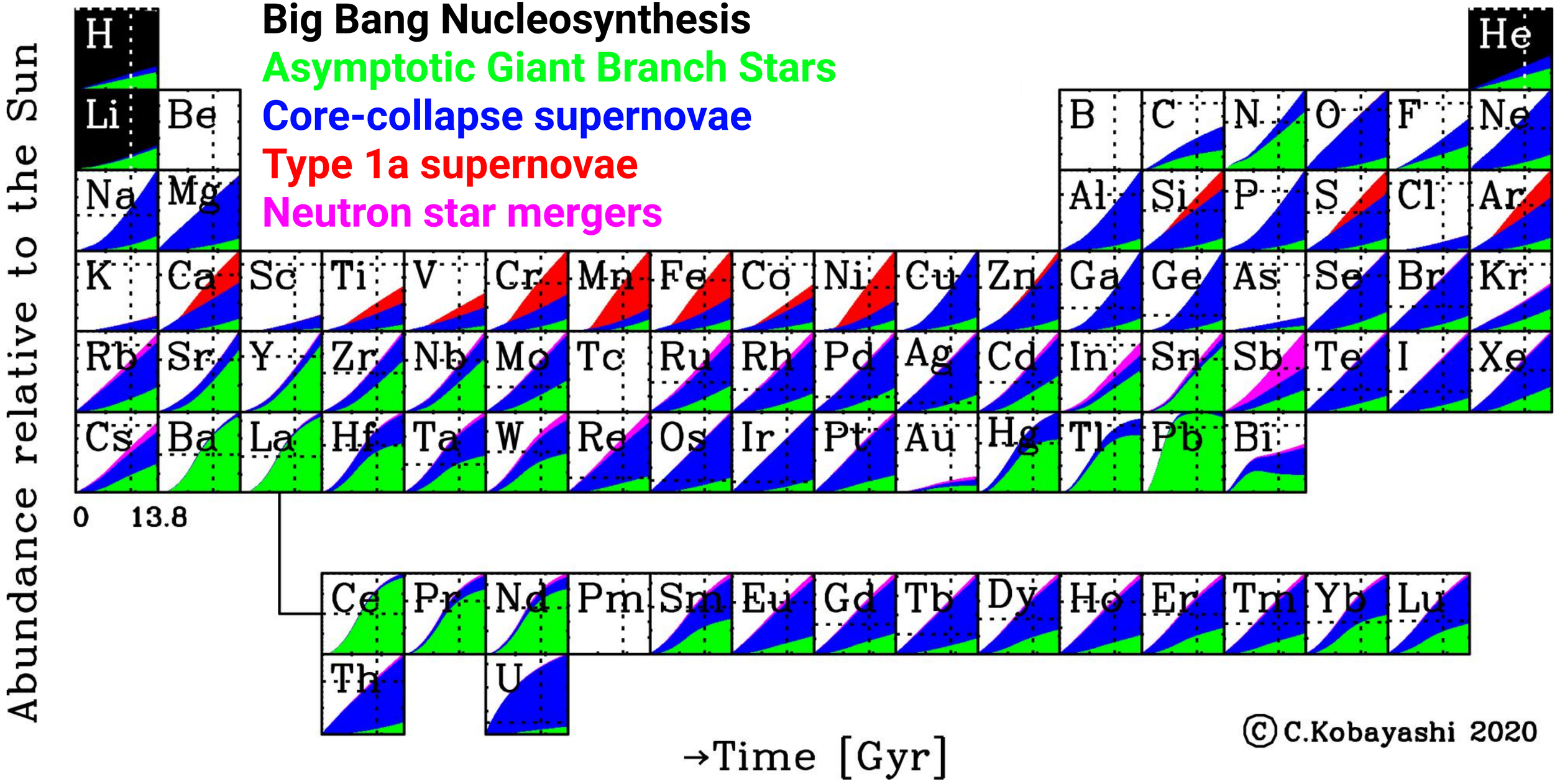
GALactic archaeology with HERMES

Observing one million stars in the Milky Way with HERMES on the Anglo-Australian Telescope

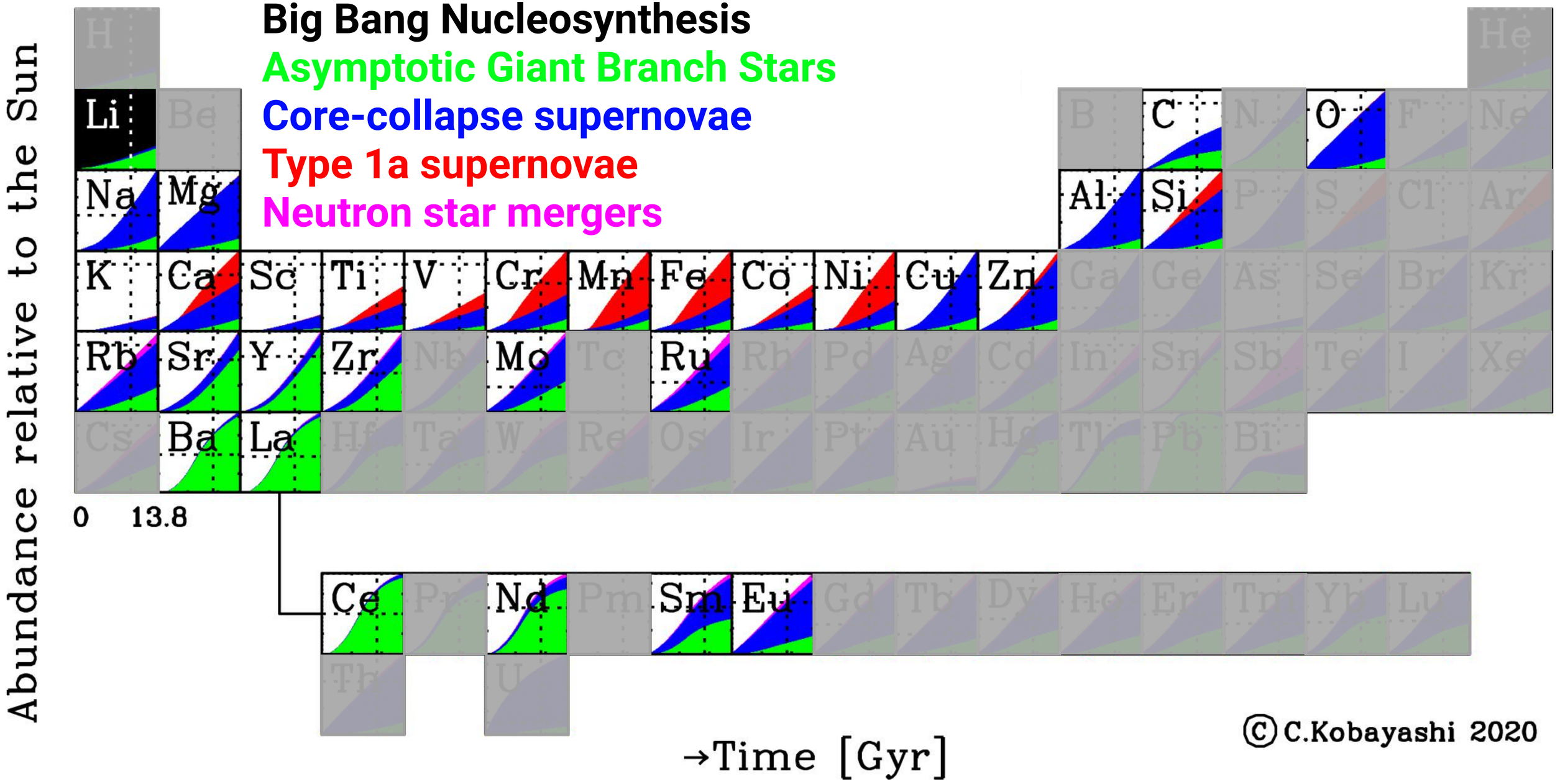
From these spectra, measuring for each star the abundances for up to 30 elements

Goal of chemical tagging: identifying stars that were born together

www.galah-survey.org



Kobayashi, Karakas, Lugaro (2020)



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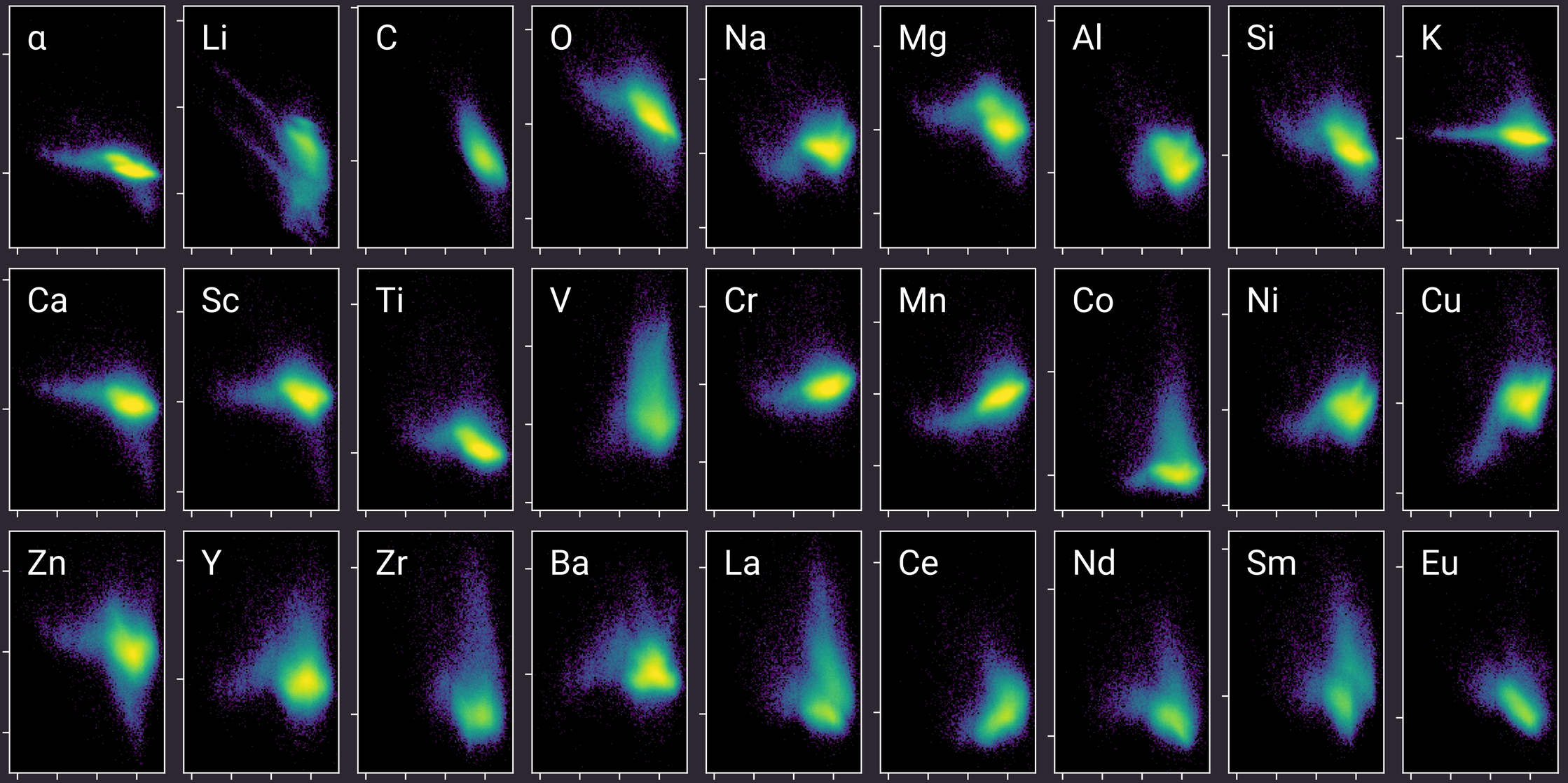
The GALAH DR3 Abundance Set



Buder et al (2021)

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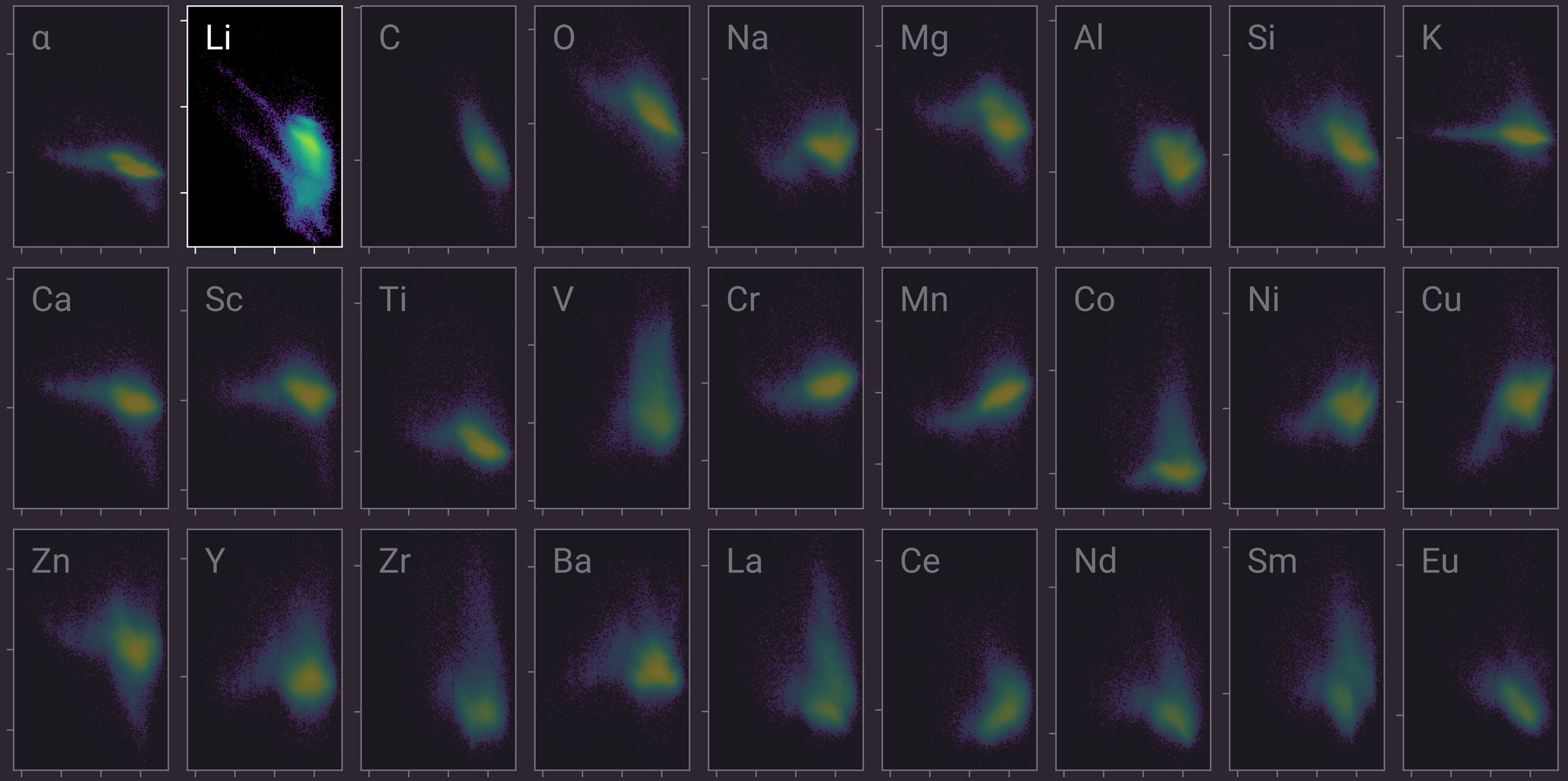

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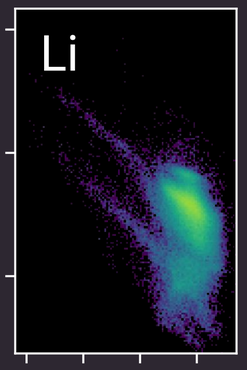
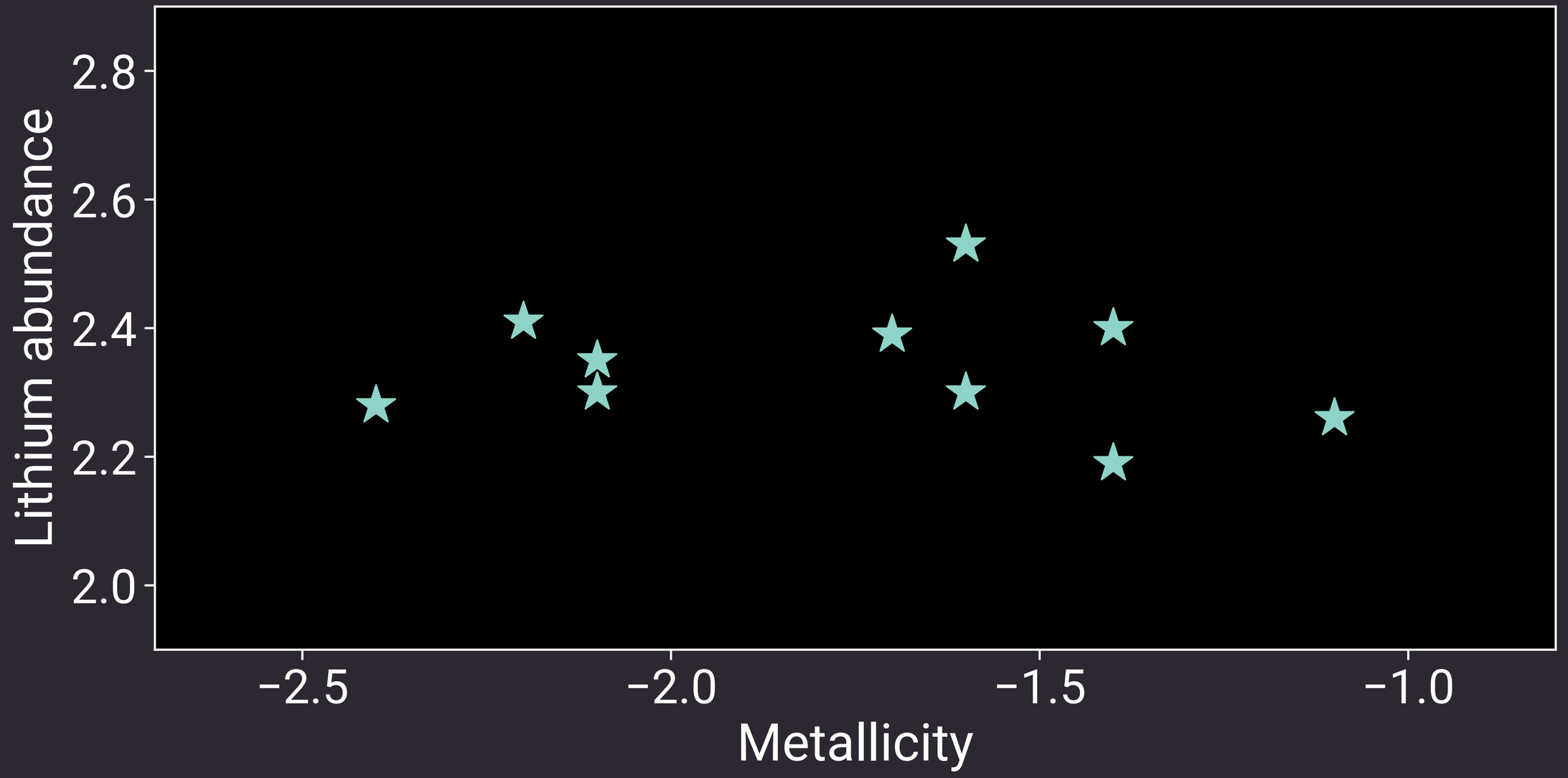


Lithium.

The only element that matters

Buder et al (2021)

Way, way back in the 1980s, **Spite & Spite (1982)** measured the amount of lithium in ten halo stars, and discovered the **Spite Plateau**



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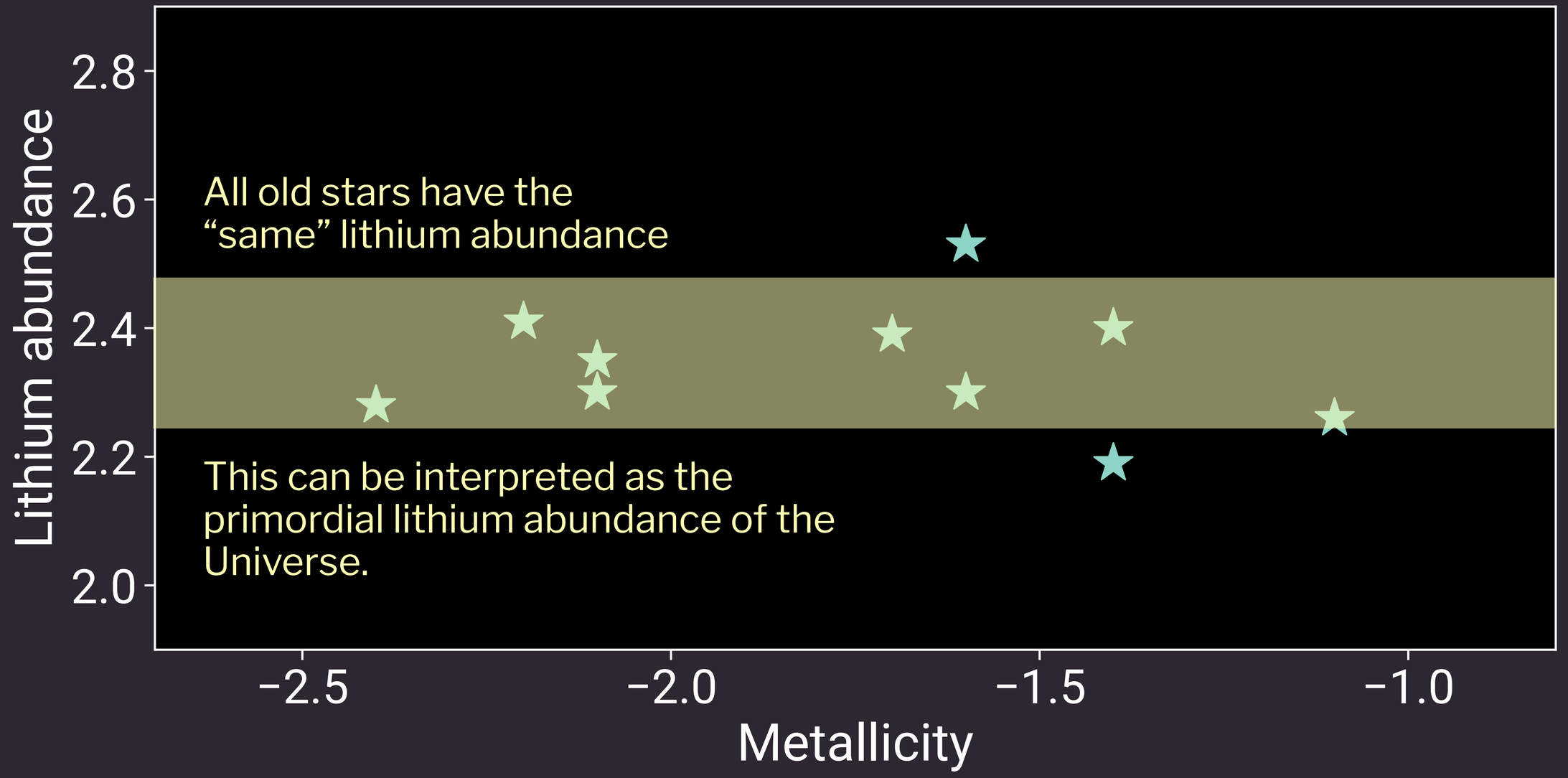
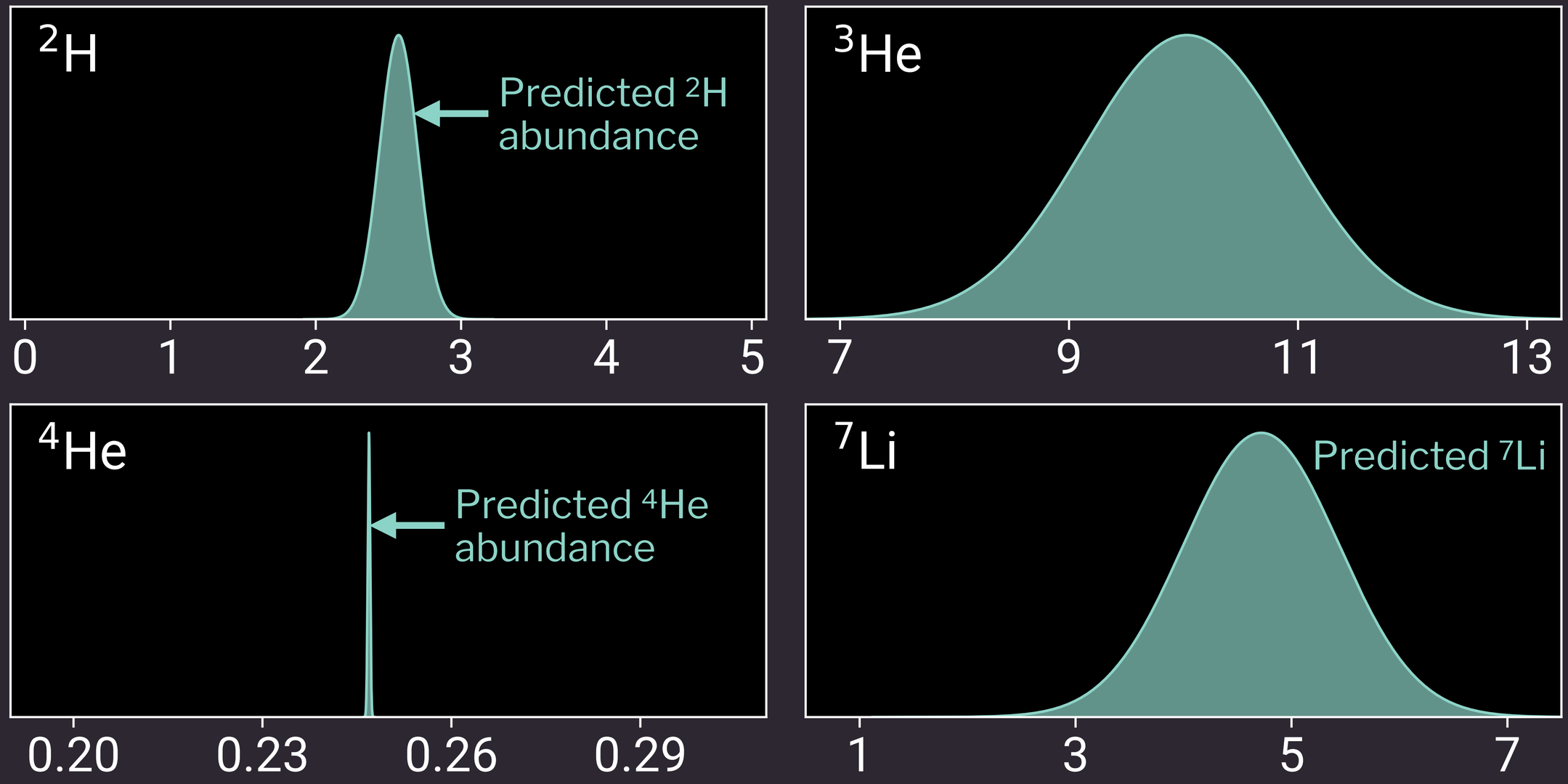


Big Bang Nucleosynthesis predicts how much hydrogen, helium, and lithium were formed in the early Universe (see Fields *et al* 2020 review)



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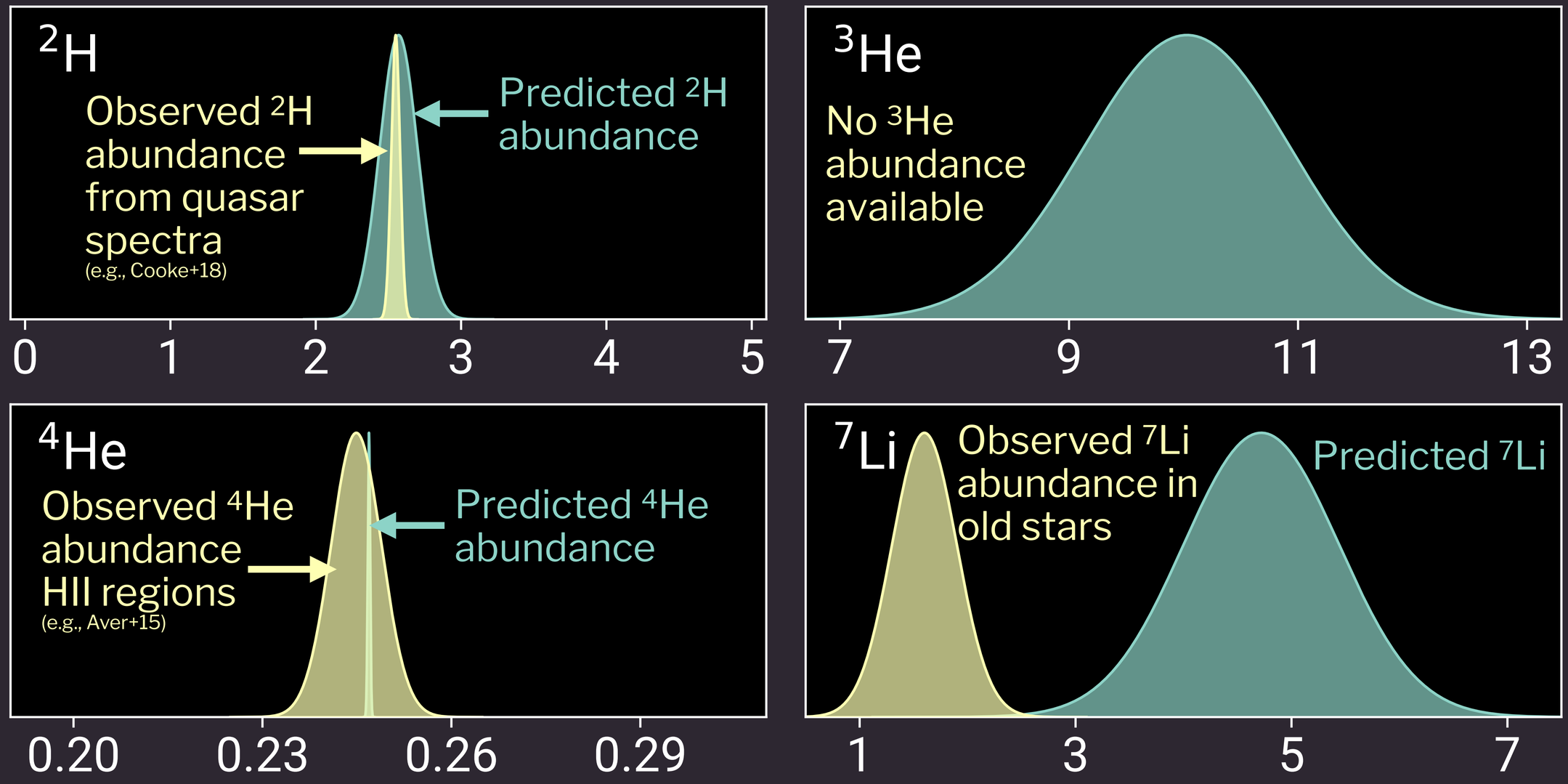

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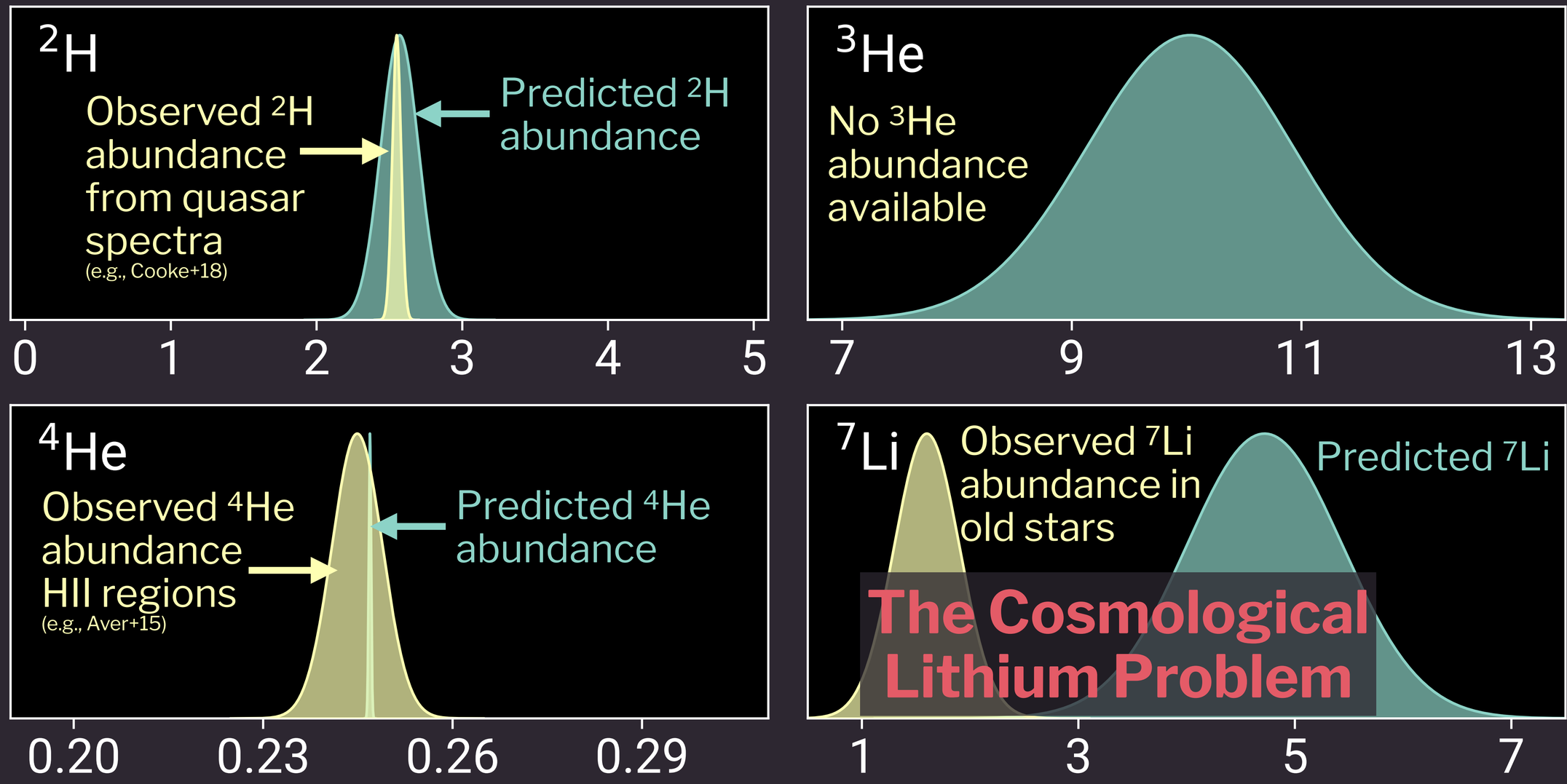

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For this we need to measure lithium in **dwarf stars***, but these are too faint to observe in other galaxies.

*Ask me about lithium-rich giant stars

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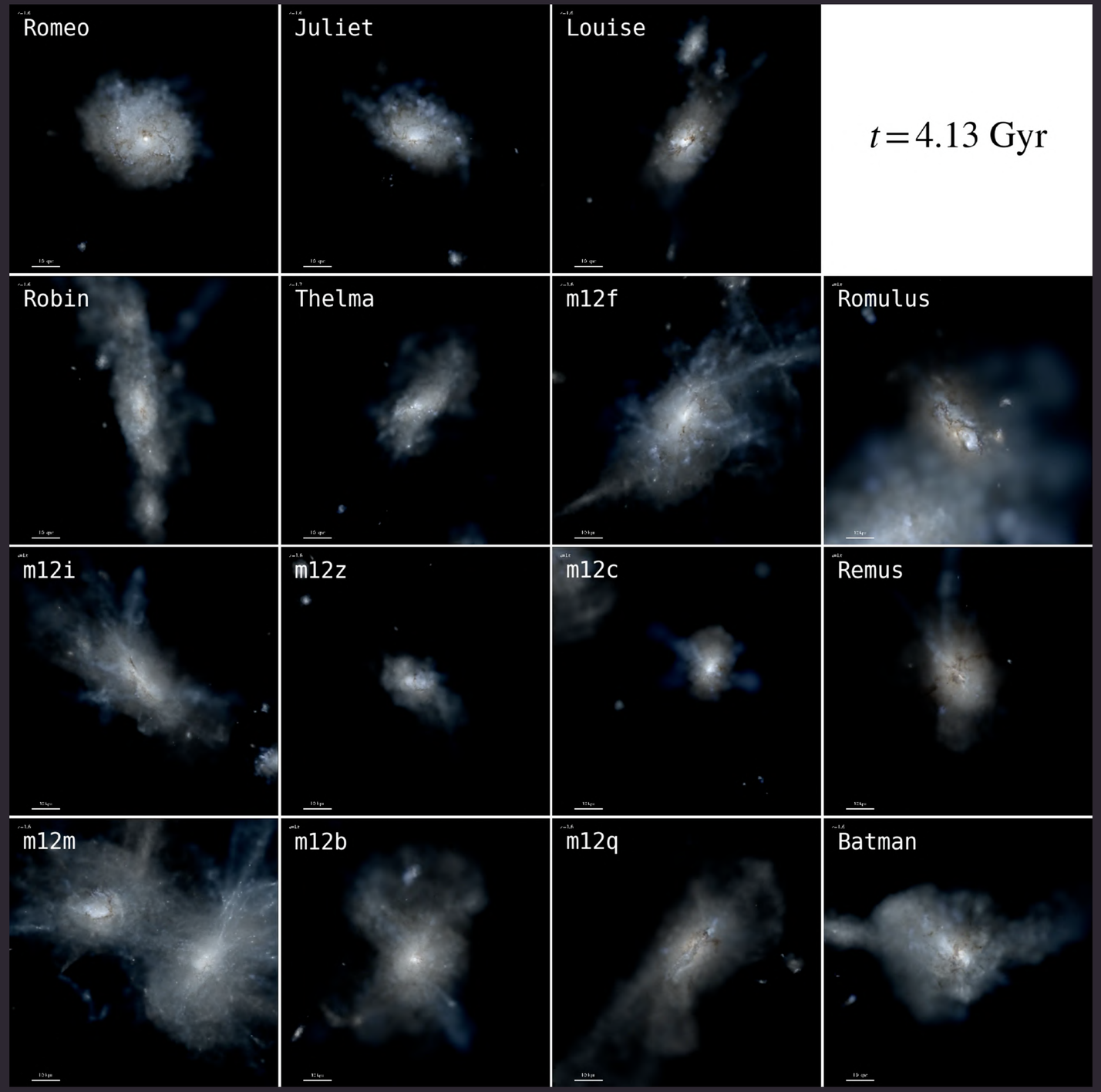
Instead of going to the stars, let's bring the stars to us!

*Ask me about lithium-rich giant stars

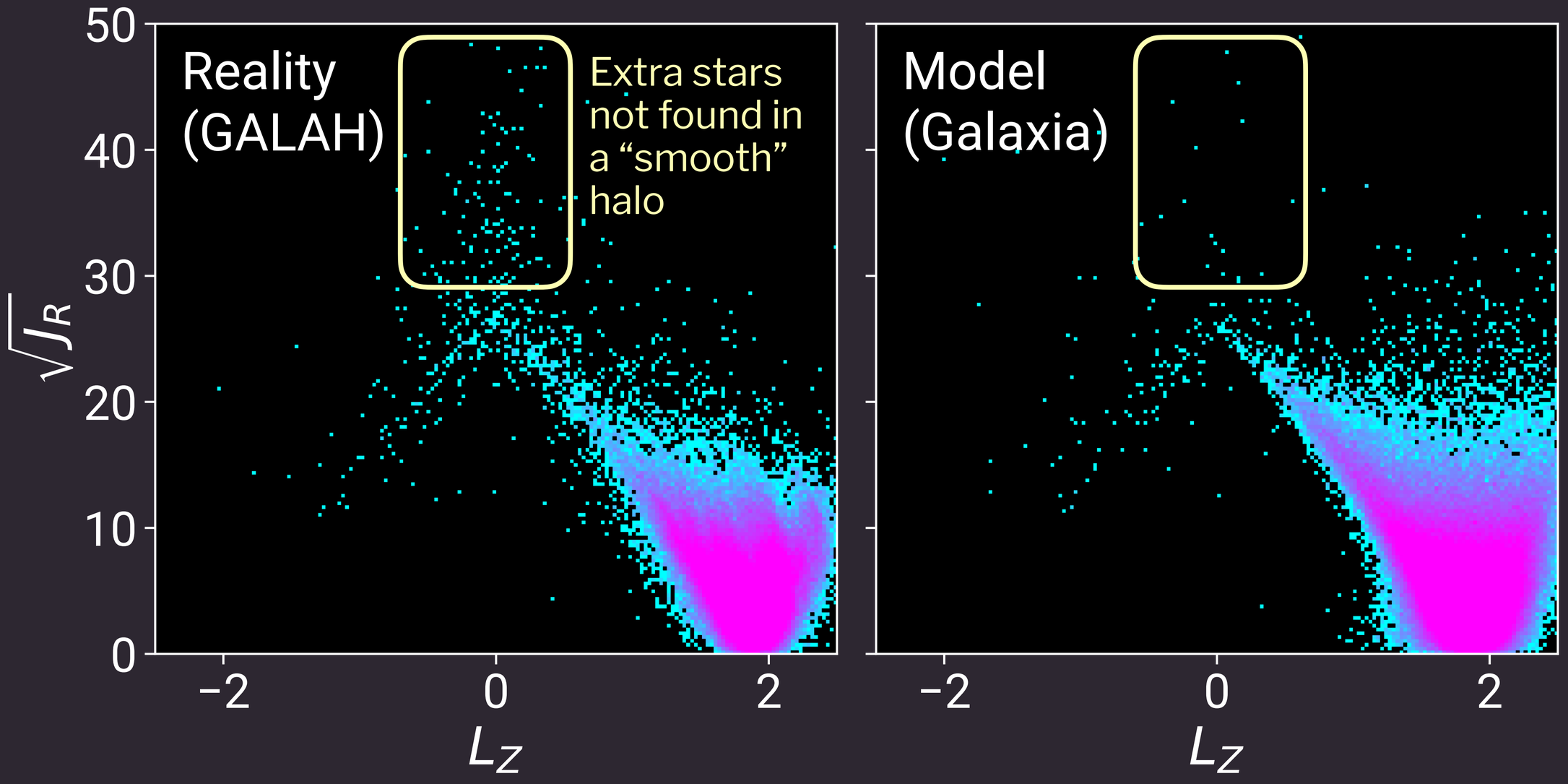


Galaxies like the Milky Way are assembled by the accretion and disruption of many smaller systems.

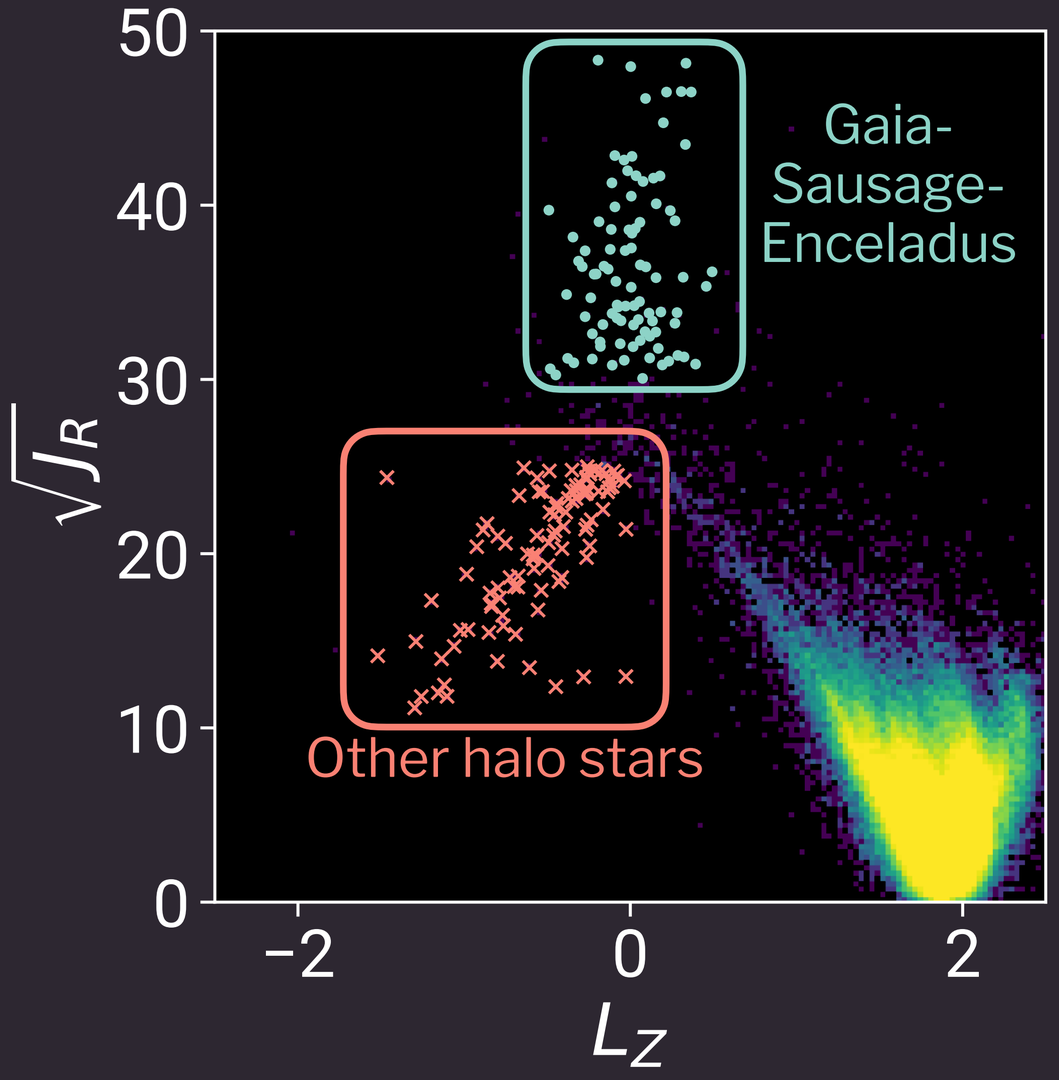
Our Galaxy should be full of stars from other galaxies.

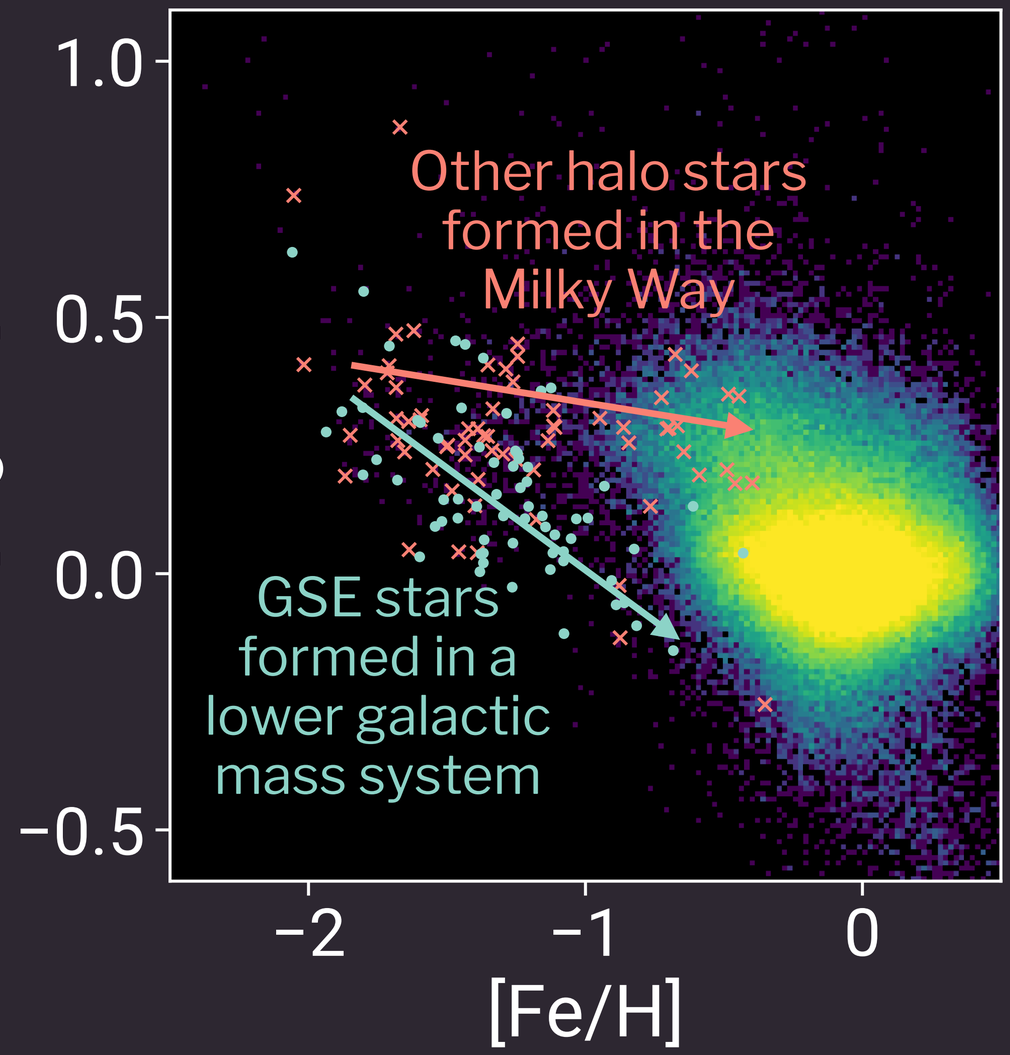
The evolution of the MW-mass FIRE-2 Galaxies
From Shea Garrison-Kimmel
http://www.tapir.caltech.edu/~sheagk/firemovies.html

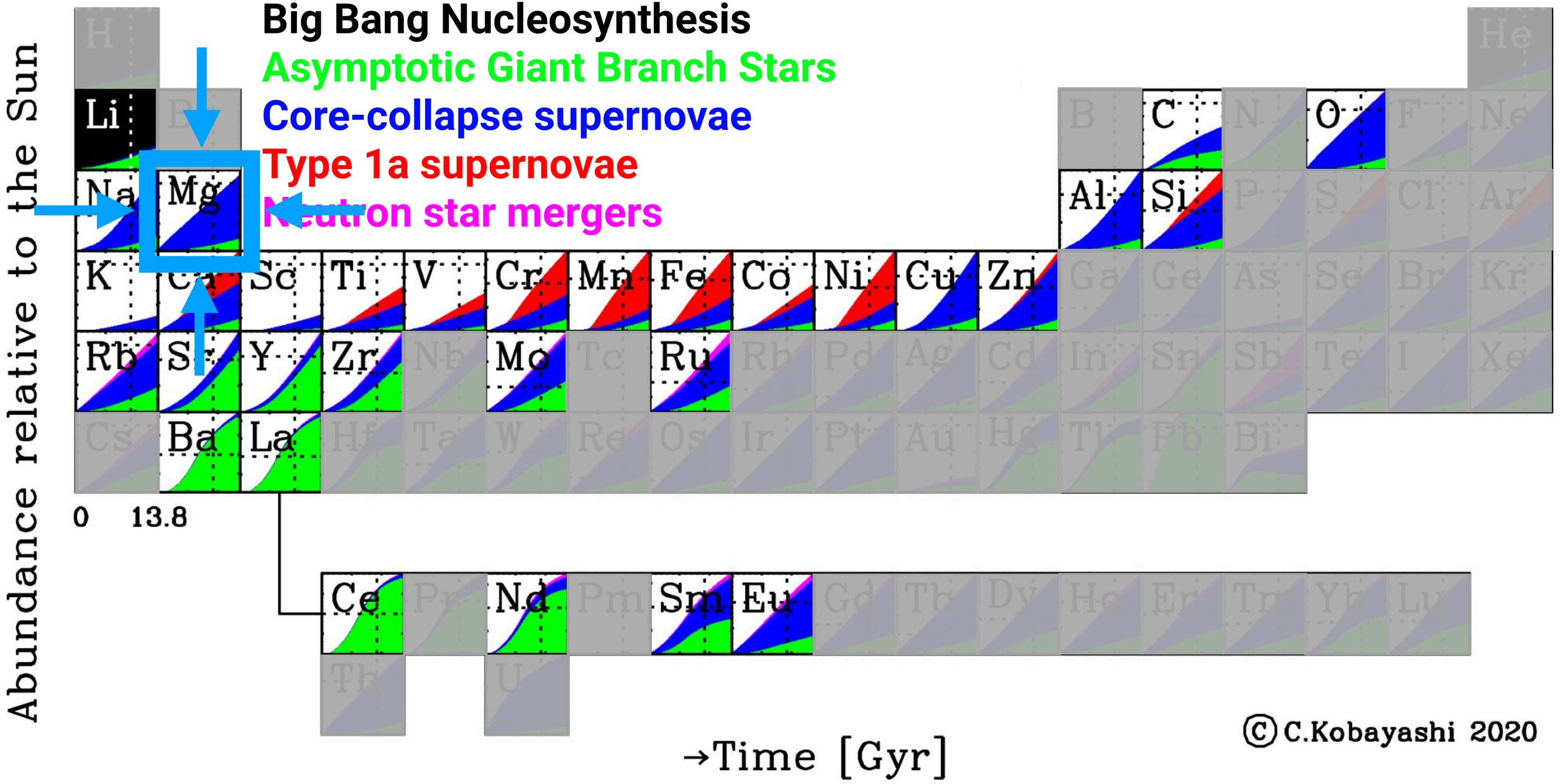
Orbits of stars in our Galaxy show that a large fraction of stars in the halo were accreted – **The Gaia-Sausage-Enceladus**



Made two selections of dwarf stars from GALAH DR3:
(1) **Gaia-Sausage-Enceladus Stars** (2) **Other halo stars**







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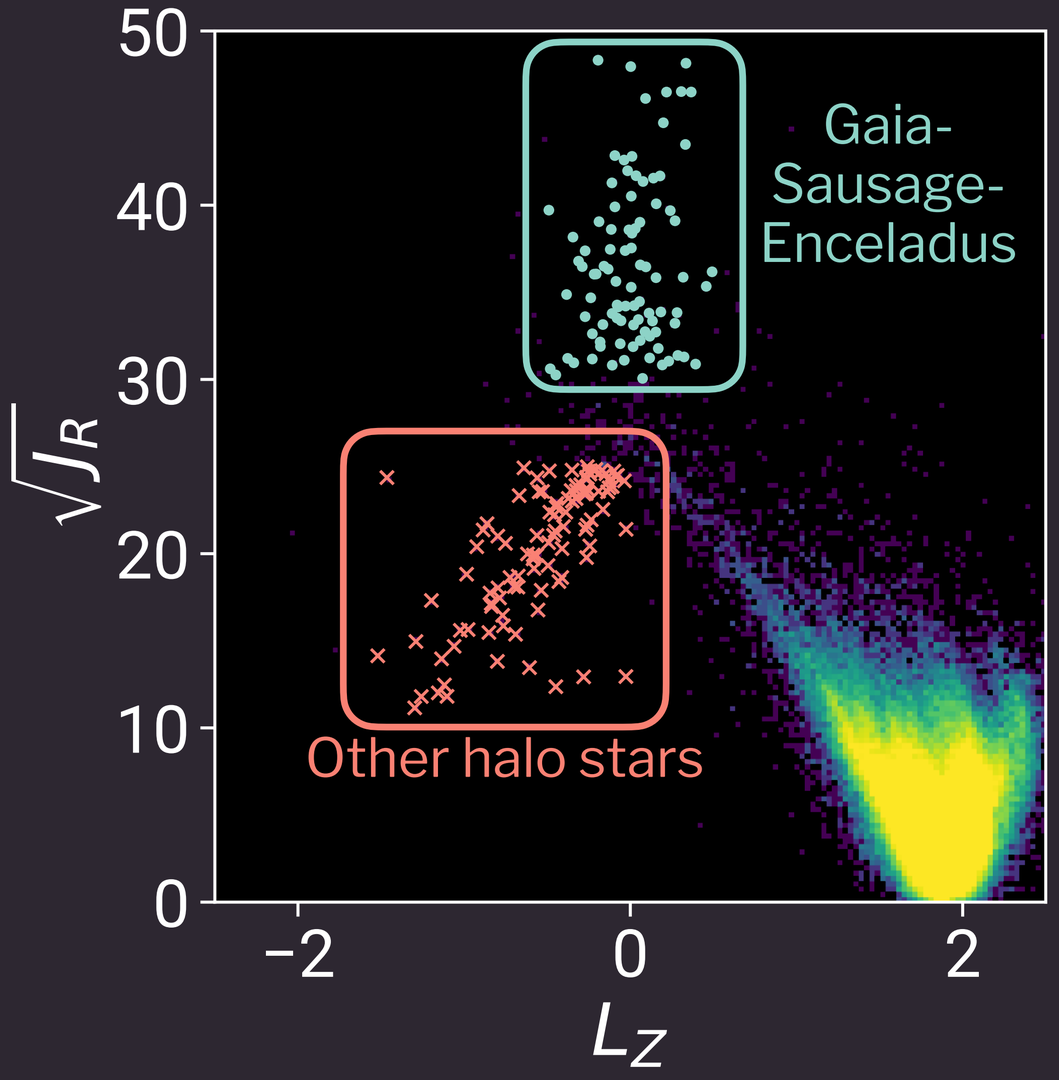

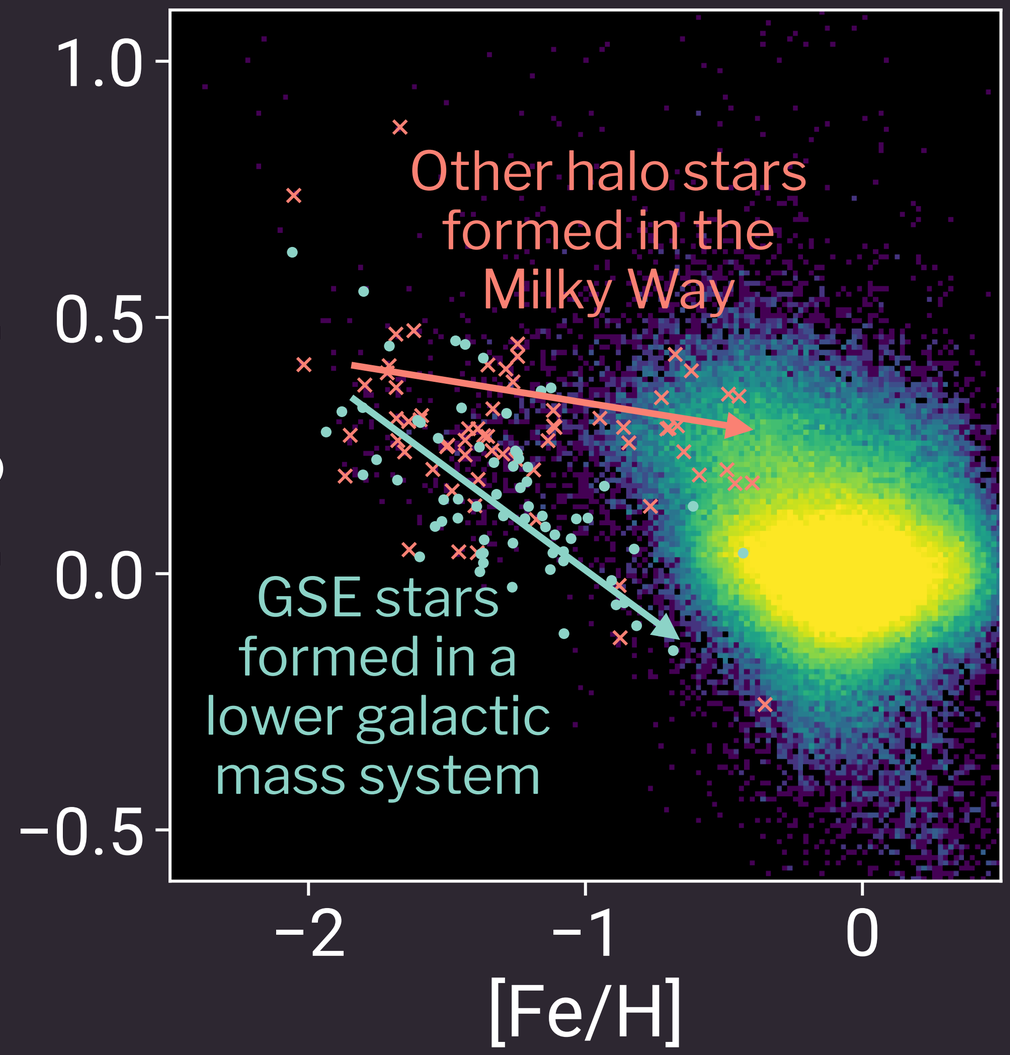

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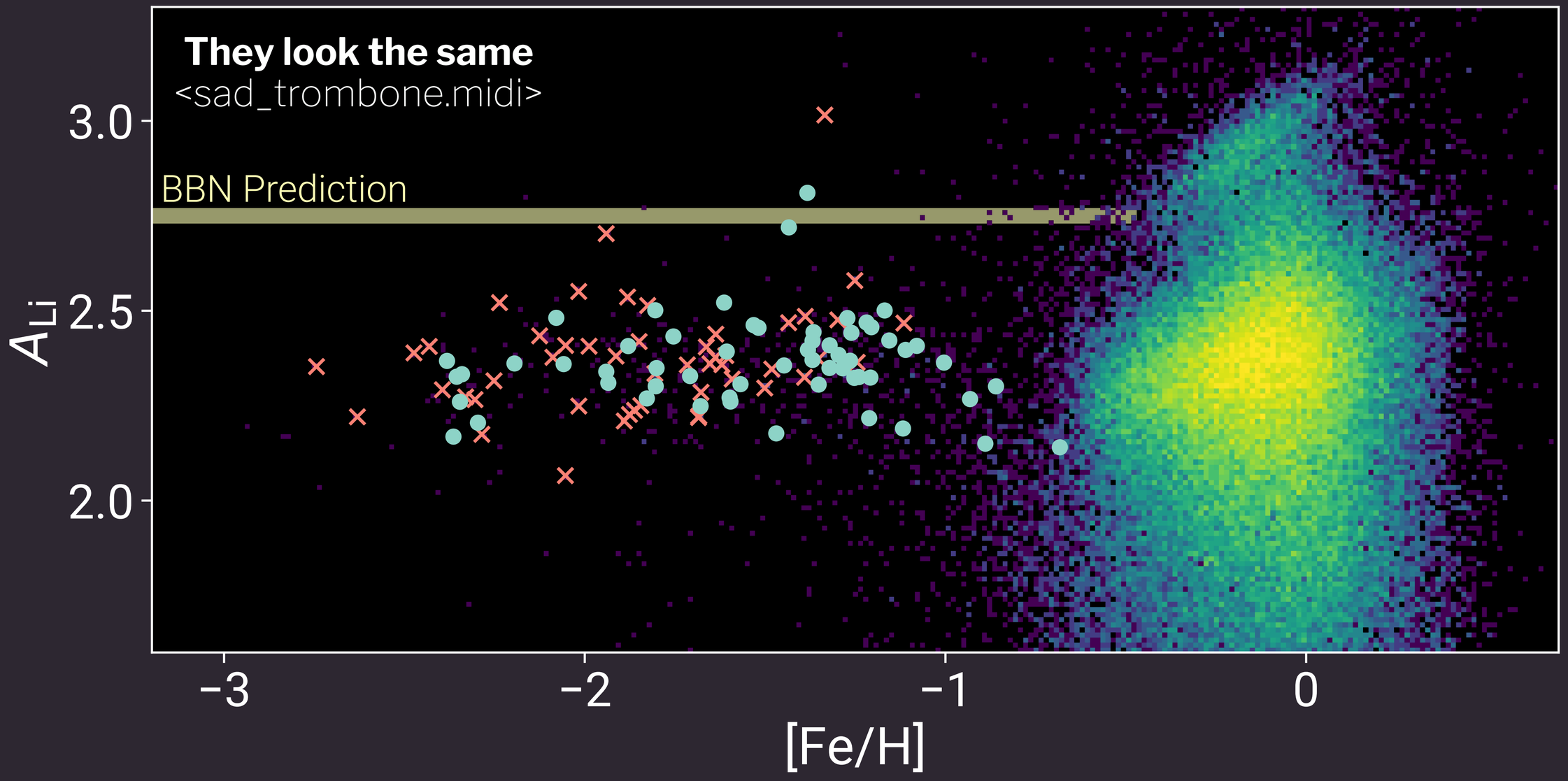

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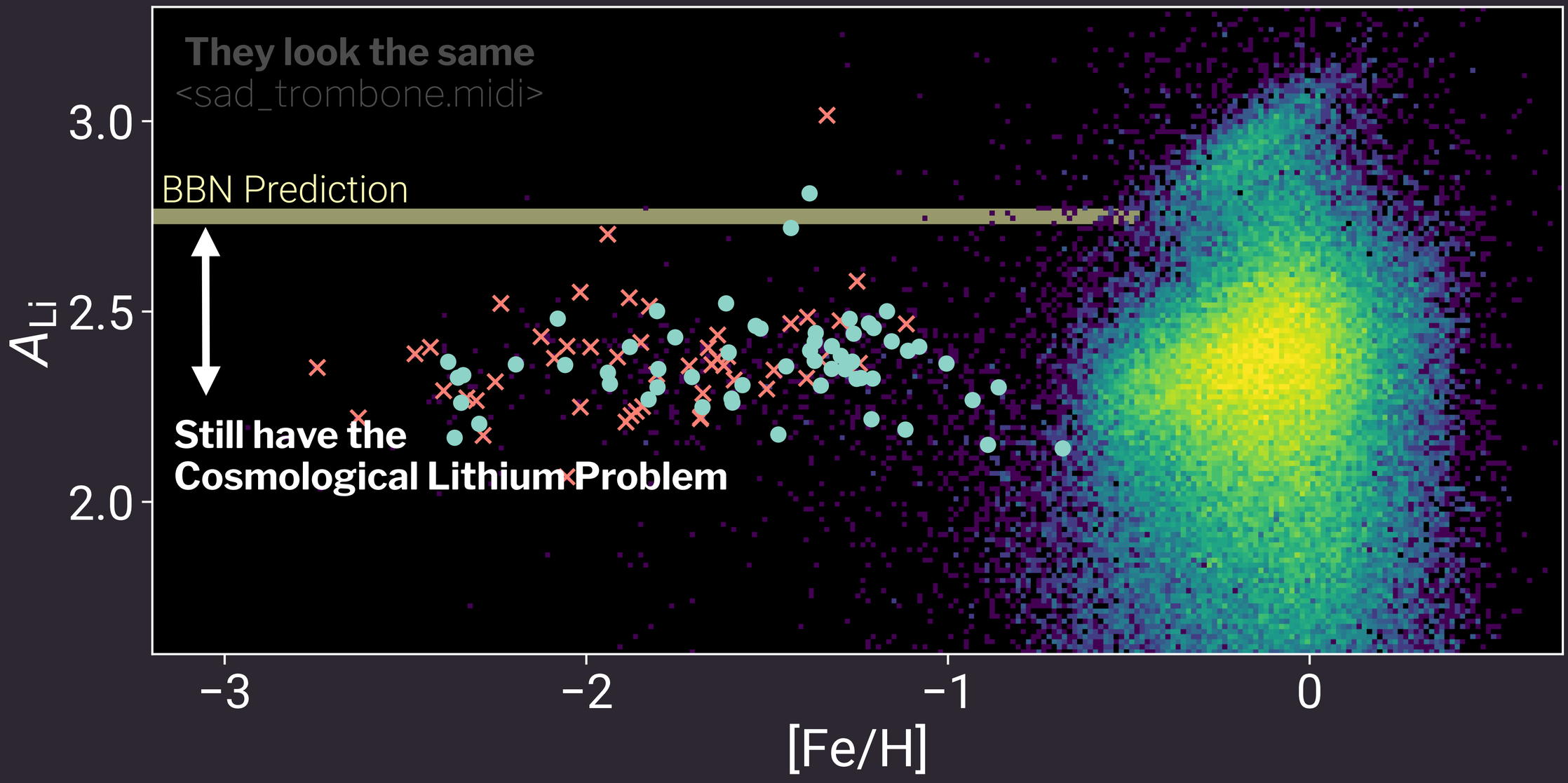
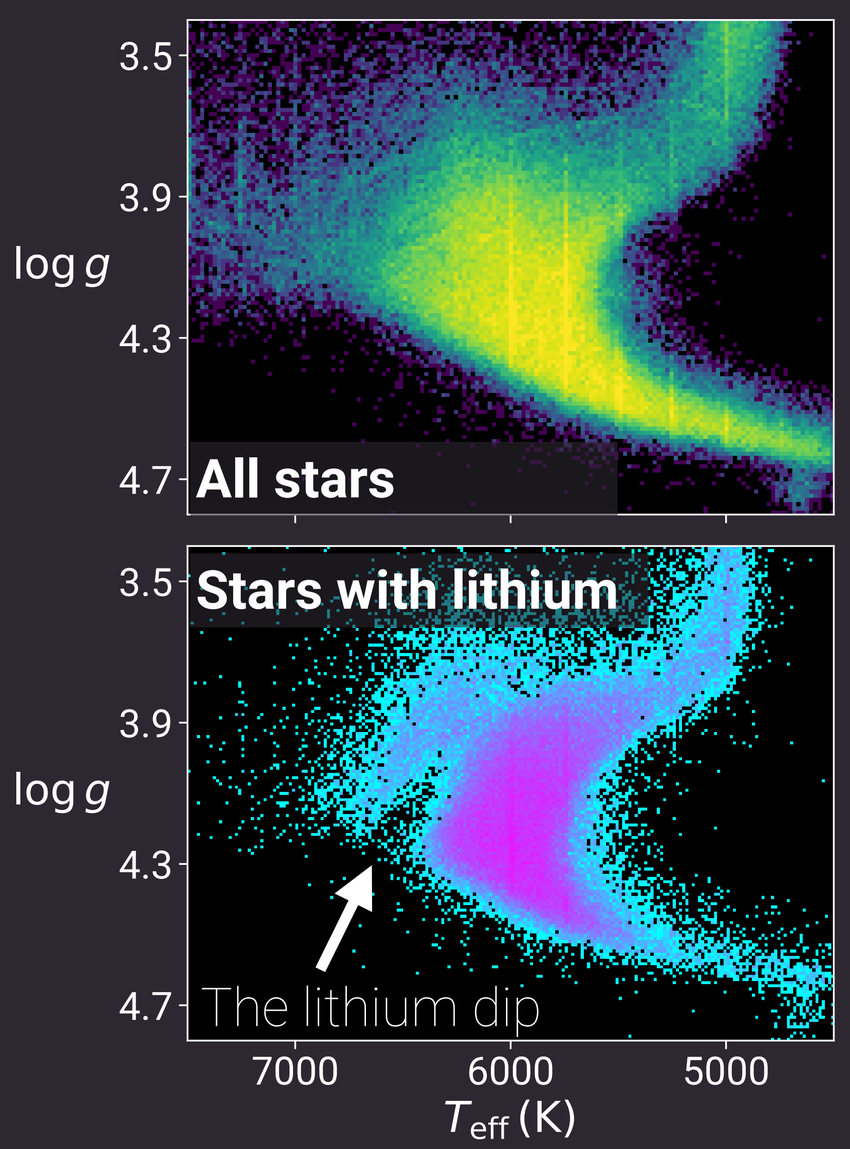
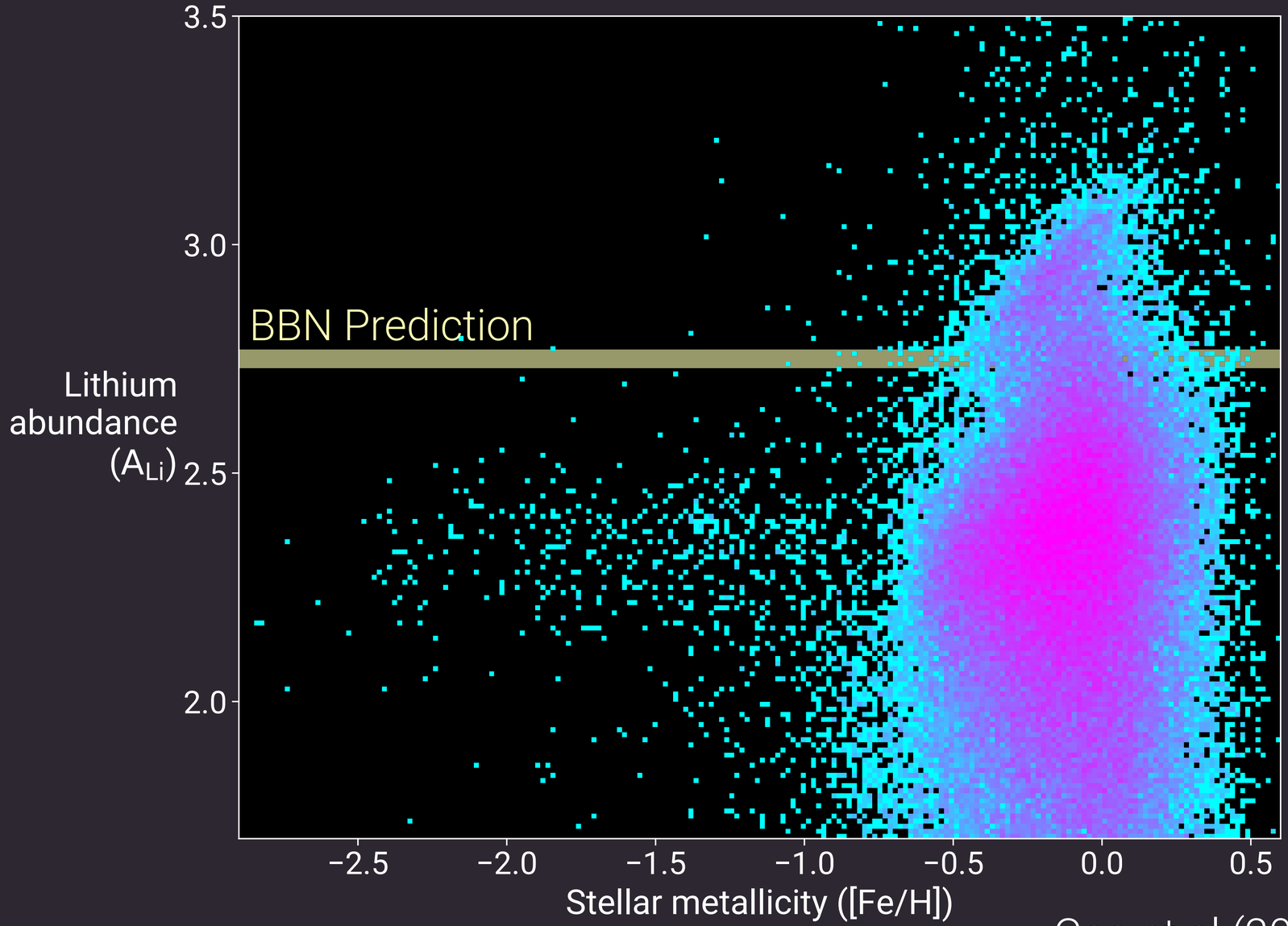


So what do we think is happening? The lithium dip?





Gao et al (2020)

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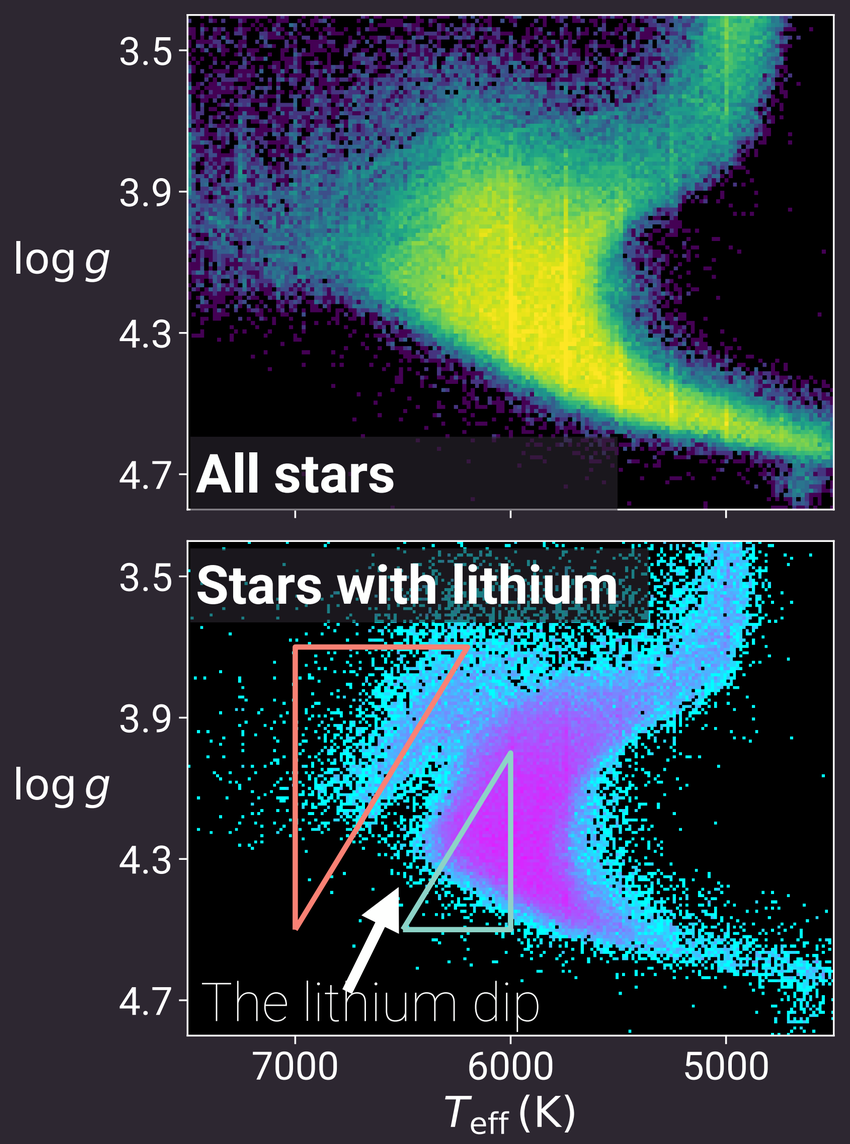

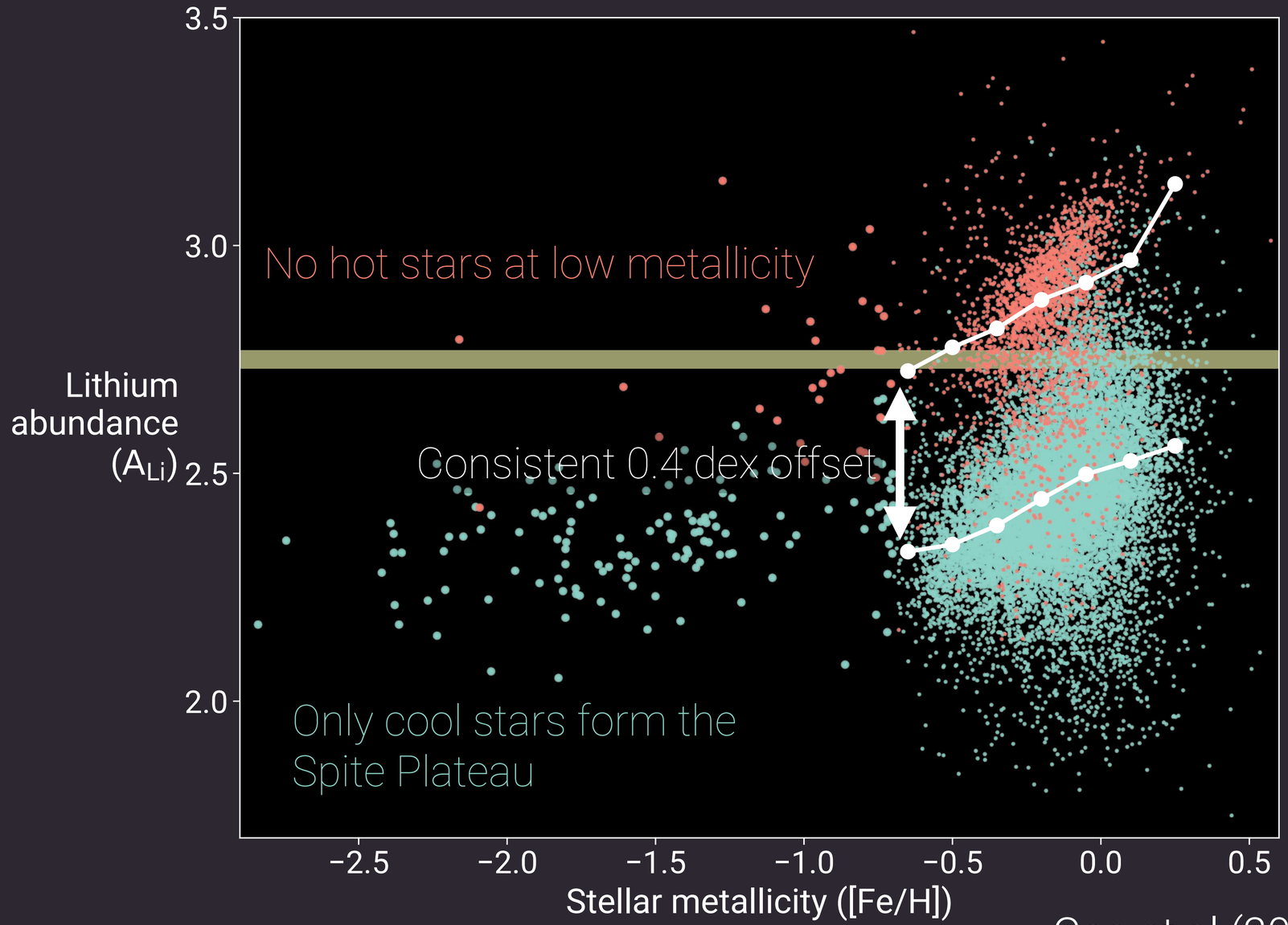

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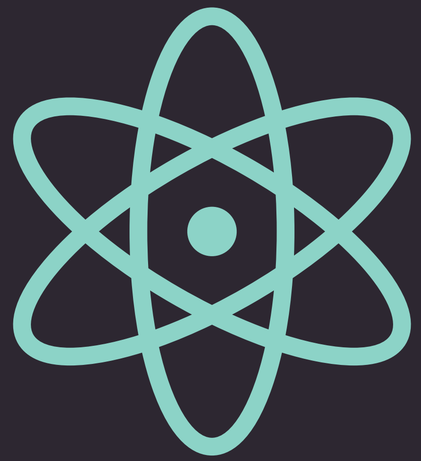
In summary

The GALAH survey is observing one million stars in the Milky Way with HERMES on the Anglo-Australian Telescope



The cosmological lithium problem exists in different kinematic populations in the halo of the Milky Way.

The Spite Plateau is a consequence of stars depleting their initial birth lithium abundance.