The Scars of Galaxy Formation: Studying stellar streams in our halo with HRMOS

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on behalf of the S^5 Team

s5collab.github.io

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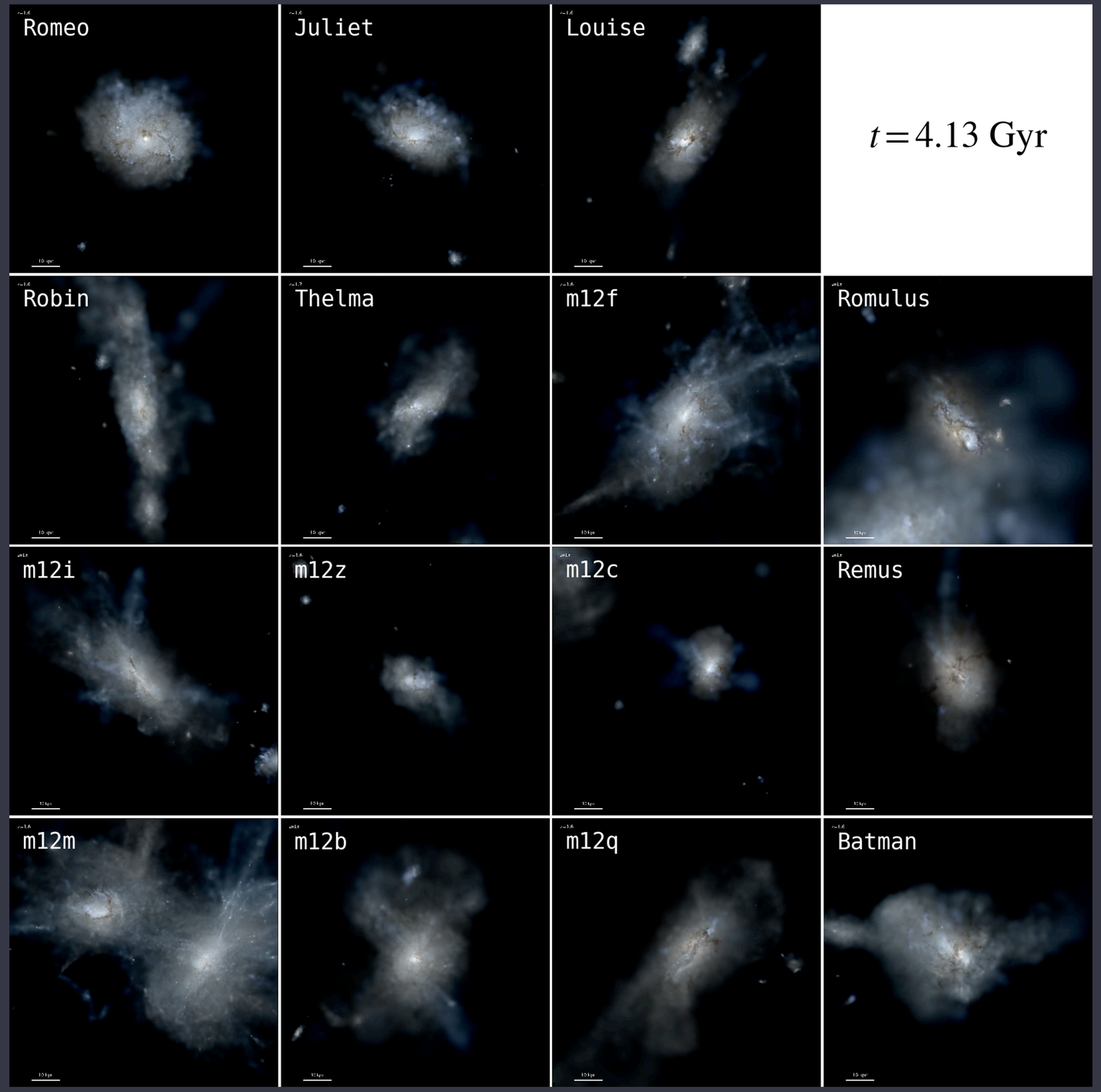


Galaxies like the Milky Way are assembled by the accretion and disruption of many smaller systems.

These disrupted systems can leave “scars" in the form of **stellar streams**.

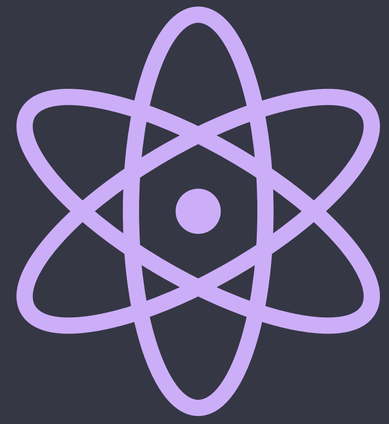
The evolution of the MW-mass FIRE-2 Galaxies
From Shea Garrison-Kimmel
http://www.tapir.caltech.edu/~sheagk/firemovies.html

Northern Sky

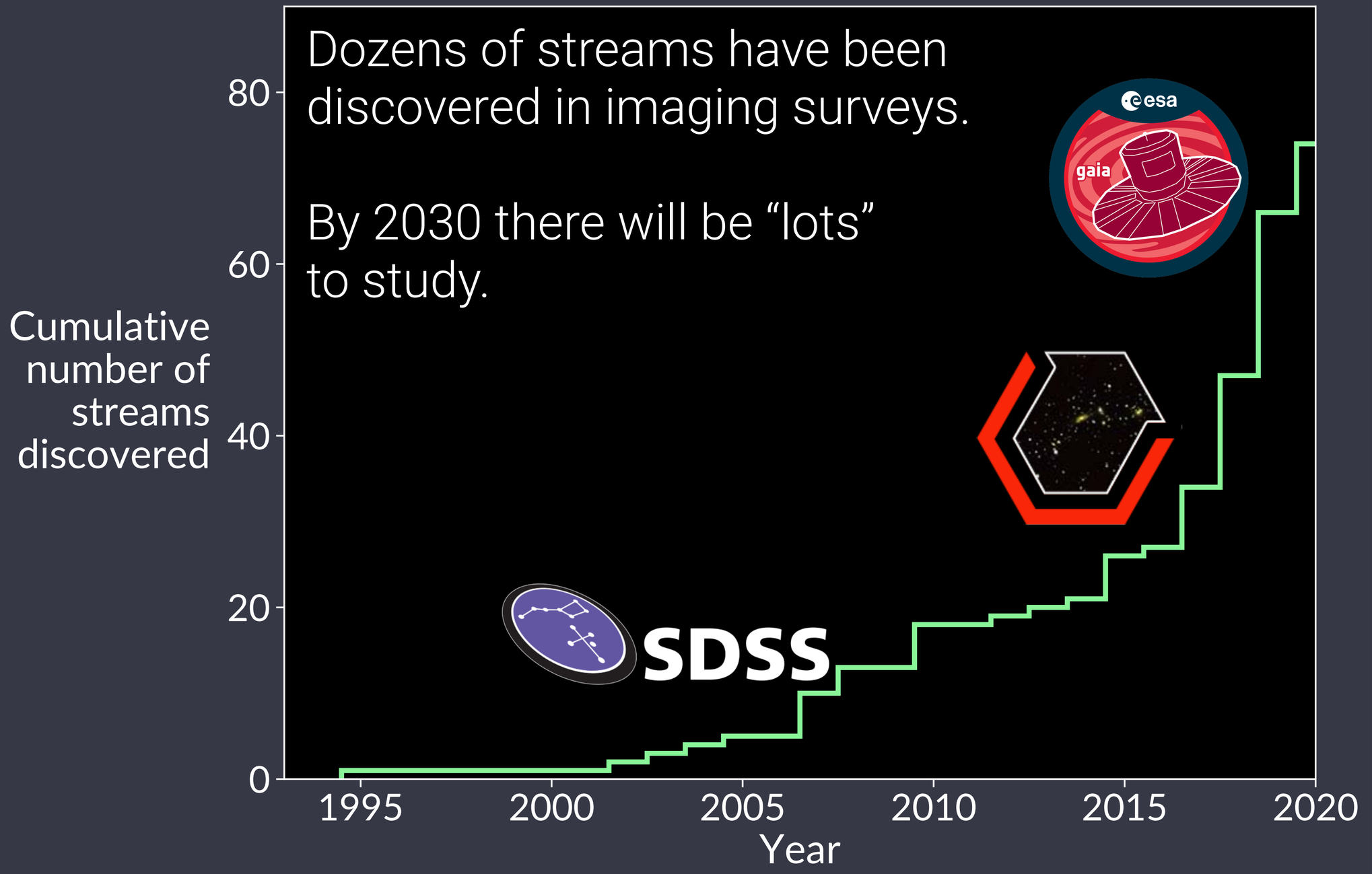
SDSS DR8 / Bonaca, Giguere, Geha

Why do we care about stellar streams?

Streams let us weigh the Galaxy
The spatial and kinematic properties of streams are highly sensitive to the mass, shape, and distribution of the Galactic gravitational potential

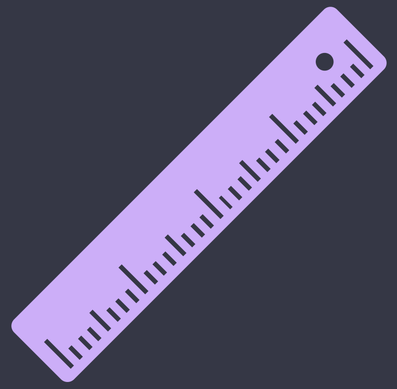


Streams are dwarf galaxies
Many streams are the remnants of dwarf galaxies, and since they are located within our Galaxy now they can be easily studied in great detail.
The real power of HRMOS


Dozens of streams have been discovered in imaging surveys.
By 2030 there will be “lots” to study.
esa
gaia
SDSS
Cumulative number of streams discovered
0
20
40
60
80
1995
2000
2005
2010
2015
2020
Year

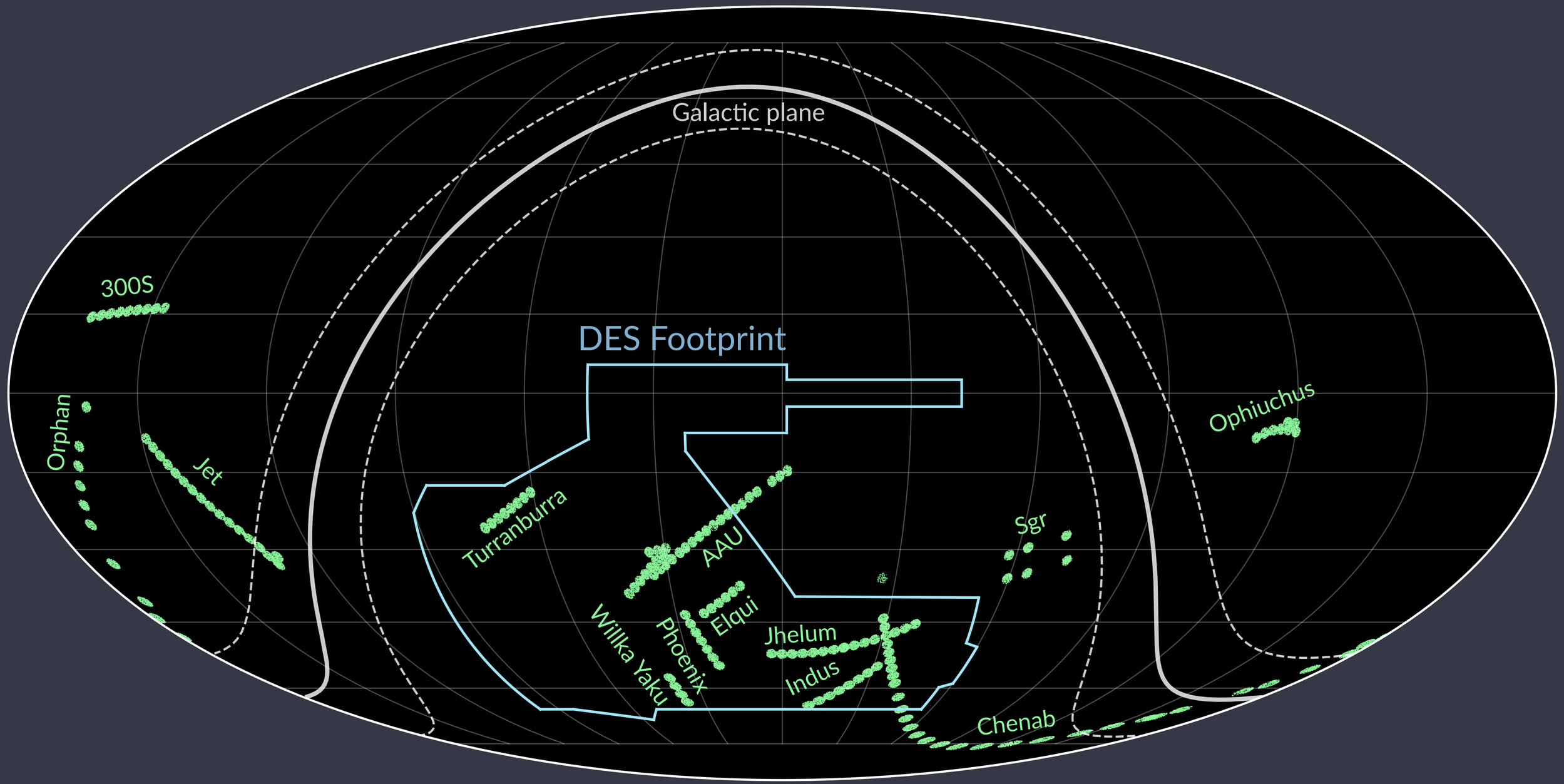
S^5 • Southern Stellar Stream Spectroscopic Survey

50 nights since 2018 on the AAT/AAOmega
80,000 targets across 20 stellar streams identified in Gaia and DES.
Low-resolution blue and high-resolution CaT spectra.

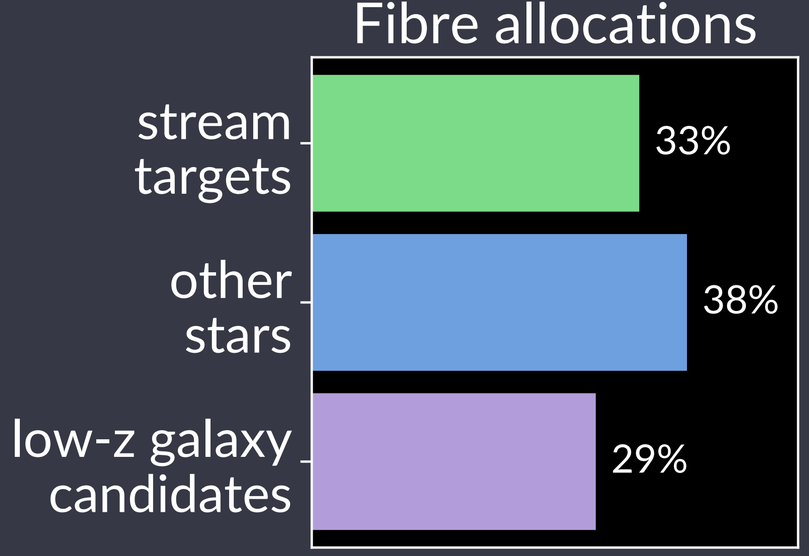


Largest homogeneously analyzed set of streams
Full 6D kinematics and metallicities for 12 streams

First public data release in April 2021
Available via our website:
s5collab.github.io

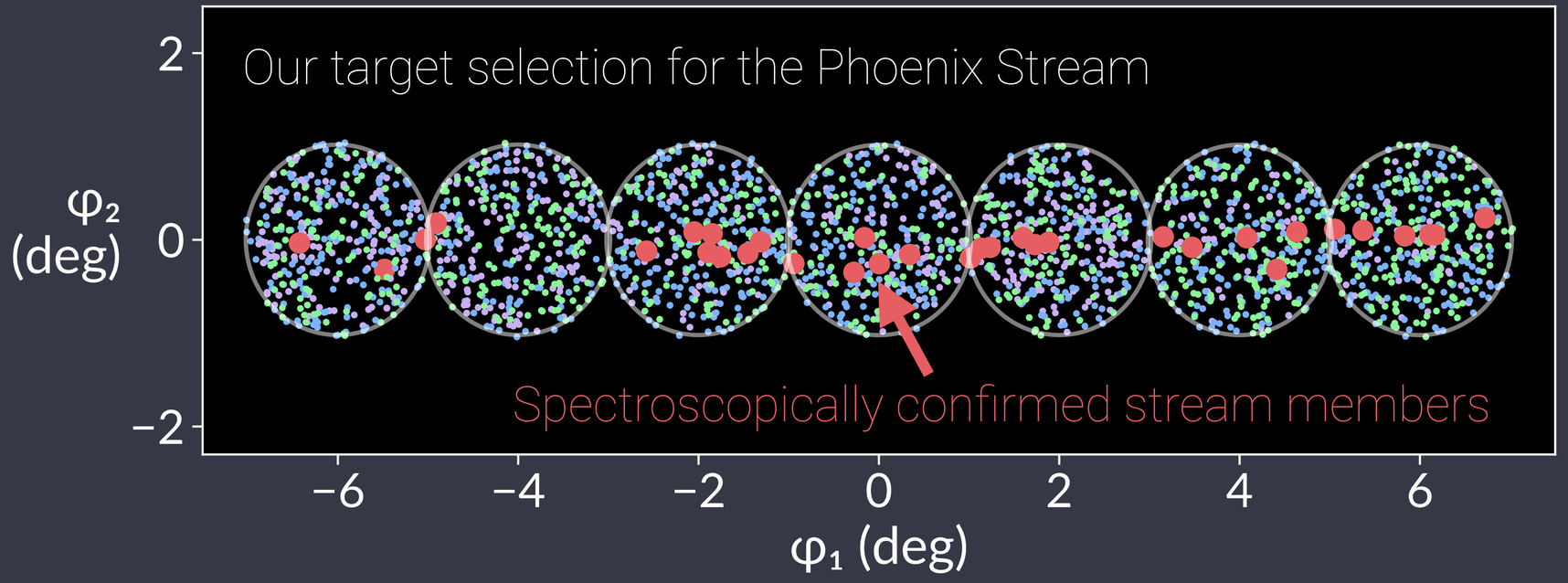

Galactic plane
DES Footprint
300S
Orphan
Jet
Turranburra
AAU
Sgr
Ophiuchus
Willka Yaku
Phoenix
Elqui
Jhelum
Indus
Chenab

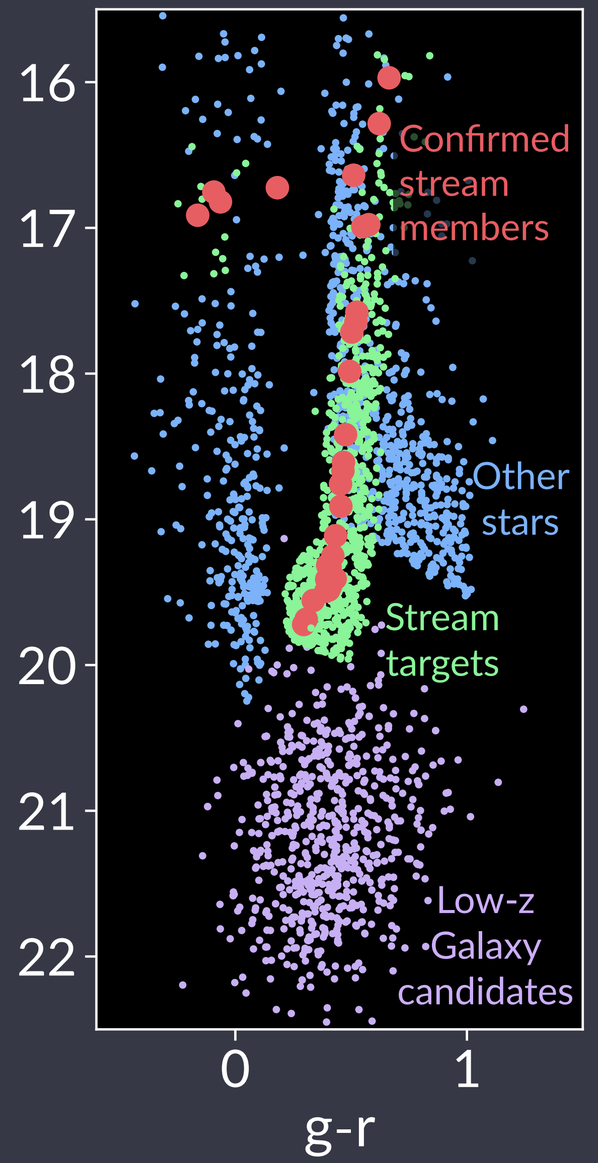
Streams are low density targets



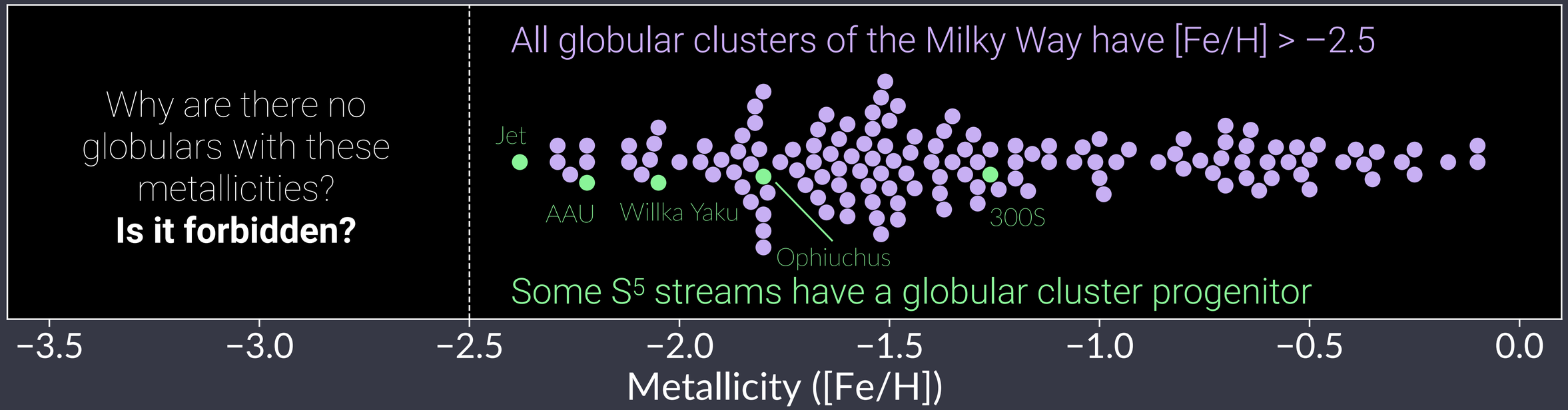
We have efficient target selection from Gaia and DES.
We only need about a third of our fibres for stream targets.

See **T. S. Li et al (2019)** for our overview, target selection, data reduction, validation, and early science





🤦 The Phoenix Stream: a globular cluster with a ‘forbidden metallicity’ 🤦



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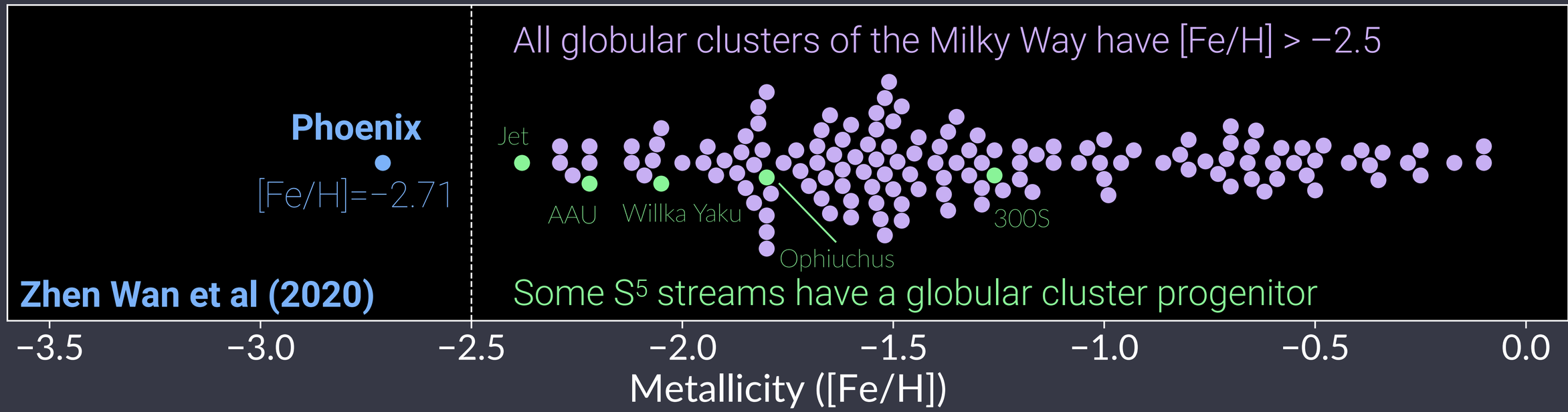

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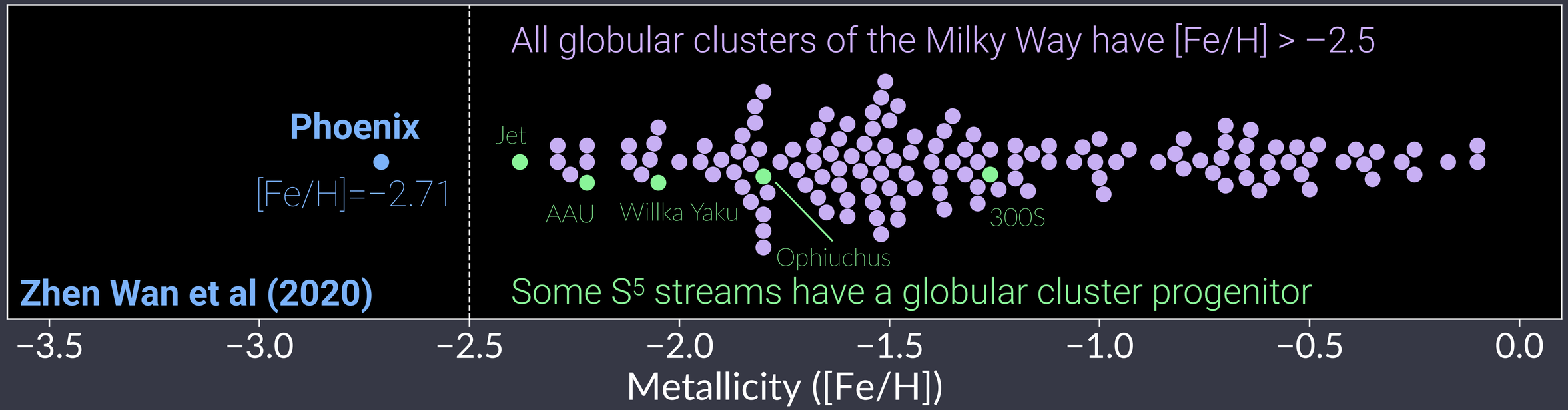
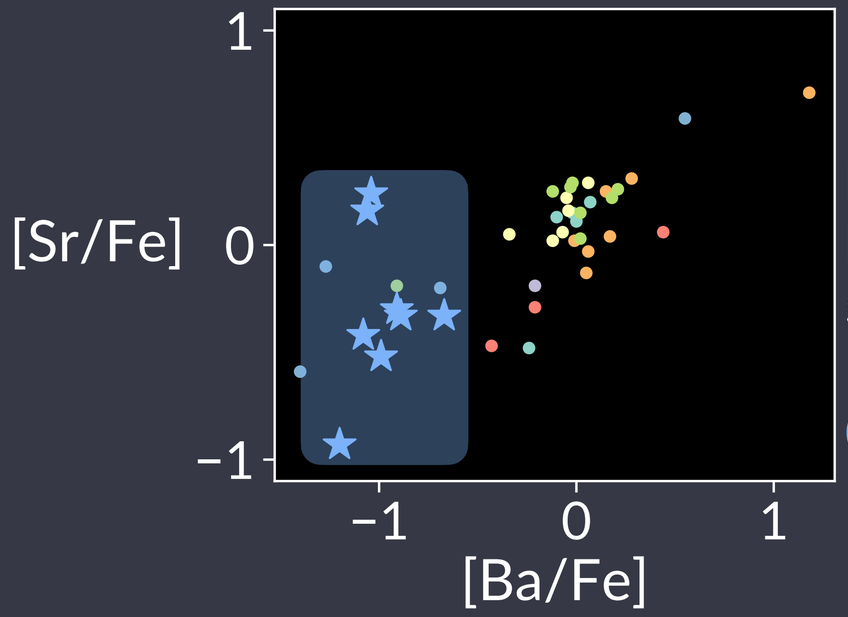


S5 is also doing high-resolution follow-up of the streams with MIKE/Magellan and will be using UVES/VLT.

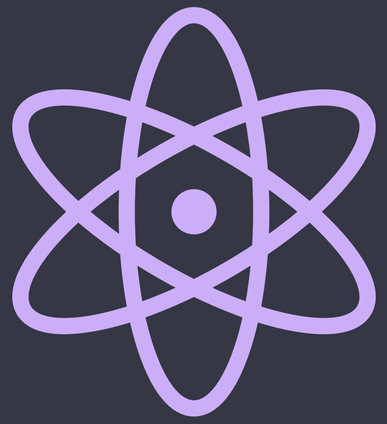
See Ji et al (2020)



Big spread in strontium. Fast rotating massive star abundance pattern.

Casey et al (2021)

What do we need from HRMOS?

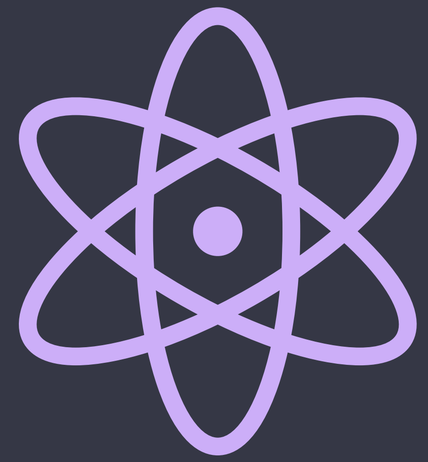


Streams are dwarf galaxies and globular cluster
So everything about why we care about these. But we can observe them with much less telescope time.

S^5 • Southern Stellar Stream Spectroscopic Survey

Stellar streams are the result of galaxy formation
They are the scars of destroyed dwarf galaxies and globular clusters. Streams let us measure the dark matter distribution of the Galaxy.

S^5 is observing and analysing 20 streams
Using the AAT to produce the largest dataset of Milky Way streams



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