Determining the luminosity of the third dredge-up via S stars: The promise of *Gaia*

- Shreeya Shetye

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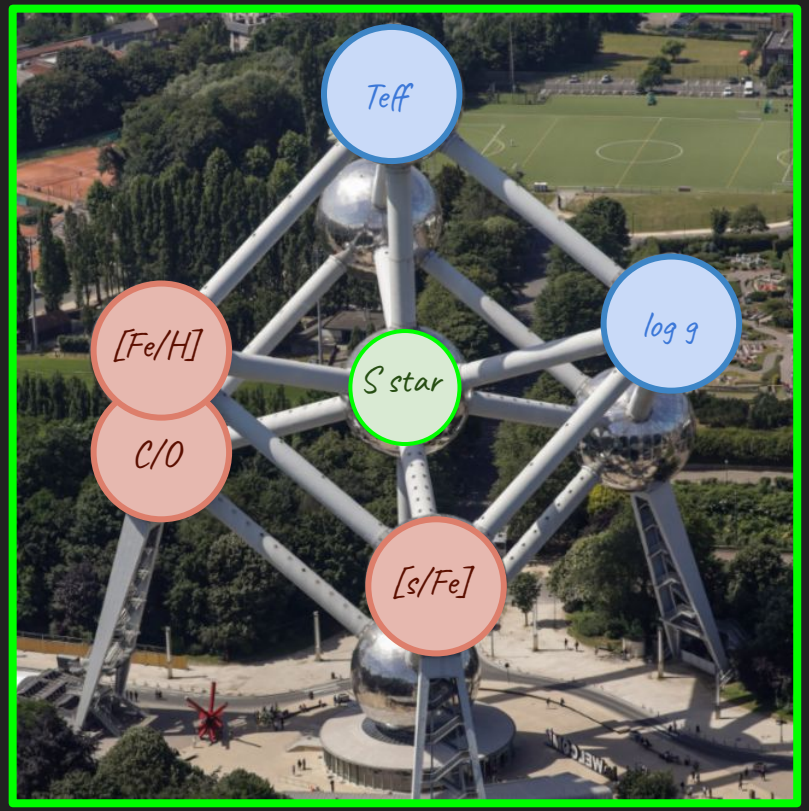
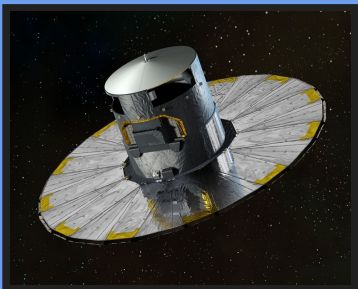
MARCS model atmospheres for S stars





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INTRODUCTION

What are S-type stars??

- Late-type giants with **ZrO** and **TiO** molecular bands.
- Transition objects between M and C stars.
- Signatures of over-abundances of **s-process (slow neutron-capture)** elements.

Types of S stars

Intrinsic S stars
Thermally Pulsing Asymptotic Giant Branch (AGB) stars

Bitrinsic
Intrinsic + Extrinsic features
Shetye et al. 2020

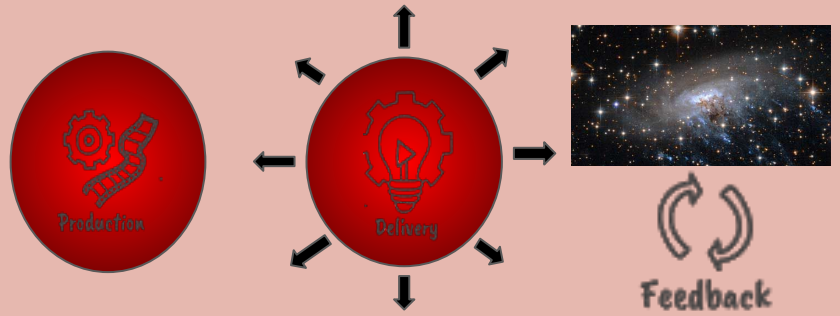
Extrinsic S stars
Polluted binaries with a former AGB companion (now WD)

Why are the S stars interesting?

Because the intrinsic S stars are the first ones on the AGB to have undergone third dredge-up.

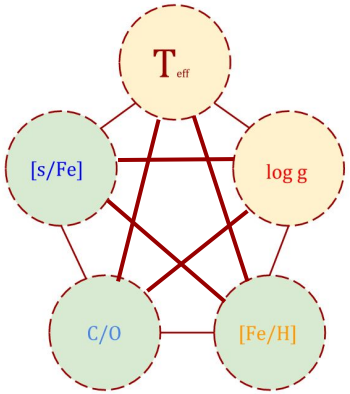
What will we understand by studying the third dredge-up?

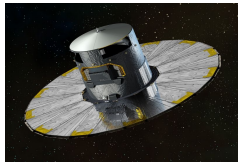
The cosmic origin of many heavy elements



Disentangling the complex parameter space of S stars

MARCS model atmospheres for S stars





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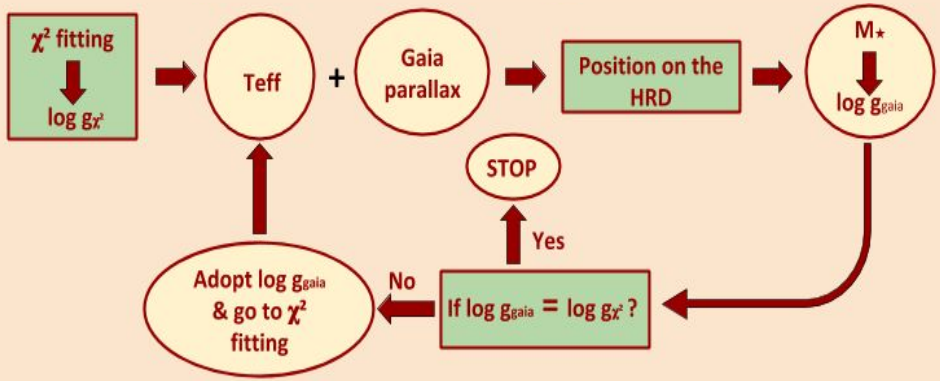
Constraining the surface gravity with Gaia

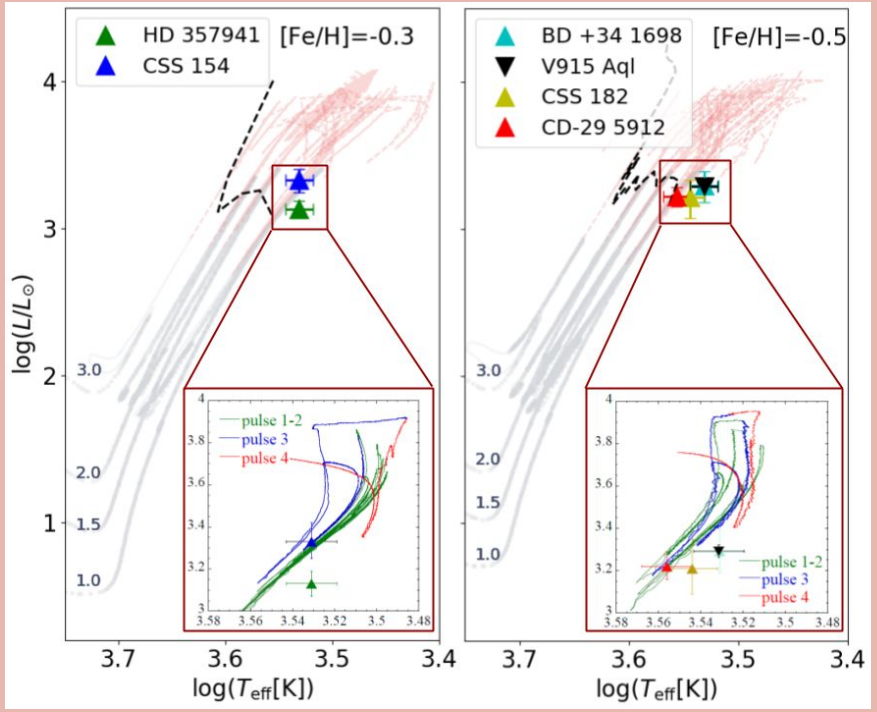


Results obtained using this S star' parameter determination methodology

- The first ***Gaia* HR diagram** of S stars (Shetye et al., 2018, A&A, 620, A148S) Feedback to → Stellar structures & evolution
- Highly accurate **s-process yields** of a large sample of AGB stars (Shetye et al., 2020, in preparation) Feedback to → Galactic chemical enrichment
- Discovery of '**bitrinsic S stars**' using Niobium & Technetium abundances (Shetye et al., 2020, A&A, 635L, 6S) Feedback to → Binary evolution, radioactive nucleii as tracers of stellar evolution

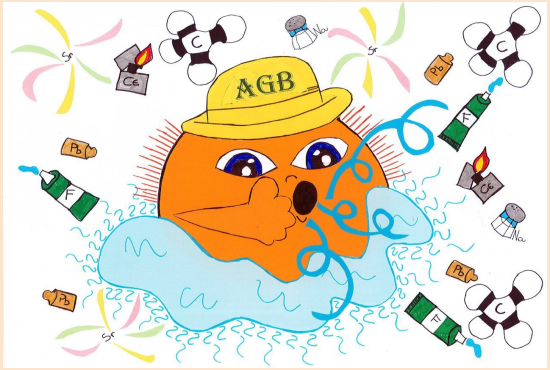
Stay tuned...

Discovery of Technetium and s-process elements in stars with sun-like mass and metallicity (Shetye et al., 2019, A&A, 625, L1)



So now we know…

- The future evolution of Sun and sun-like stars.
- s-process contribution of sun-like stars to the galactic chemical enrichment.



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