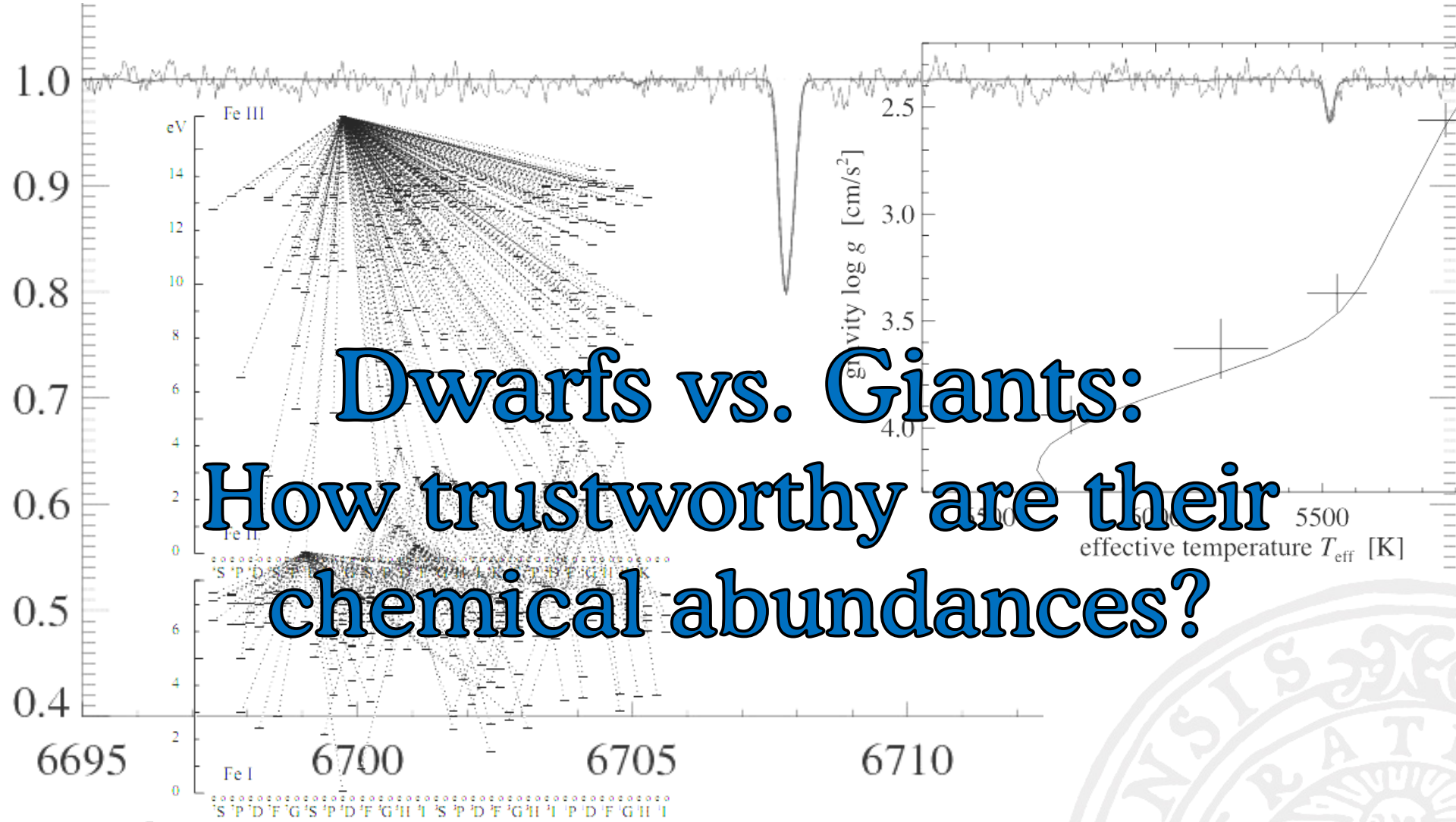

Dwarfs vs. Giants: How trustworthy are their chemical abundances?

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Advantages/disadvantages

Dwarfs

- more numerous than giants
- access to LiBeB (stellar-structure probes; BBN constraints?)
- age determinations possible

Giants

- much more luminous than dwarfs
- access to more elements (H – U)
- deep convection, efficient mixing

Sometimes nature does not give us a choice (HE 0107–5240).

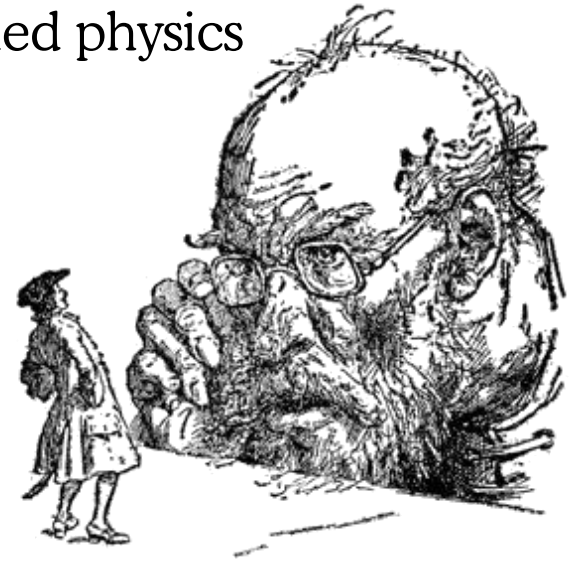
Do we expect a common composition?

Yes, as dwarfs evolve into giants.

(Need to make sure one samples the same population.)

No, because there are systematic sources of errors:

1. Biases in the modelled physics
2. Biases from unmodelled physics

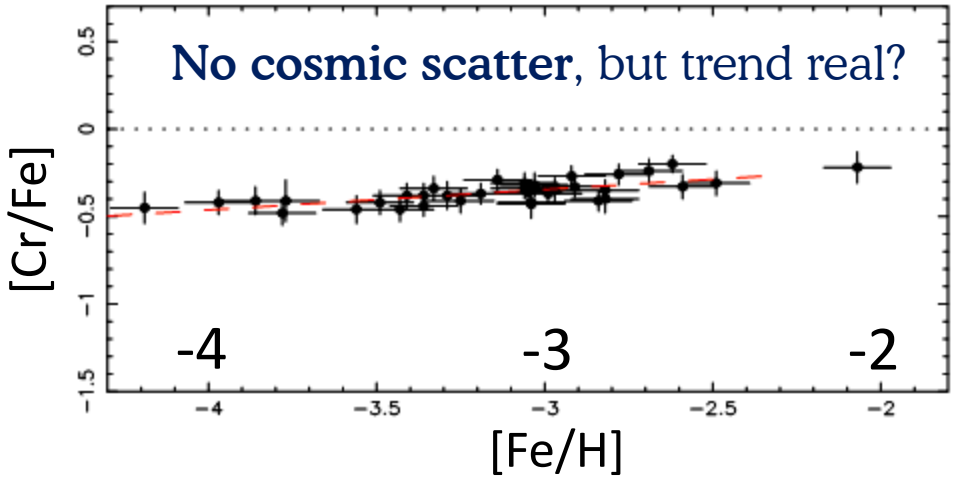


Modelling biases

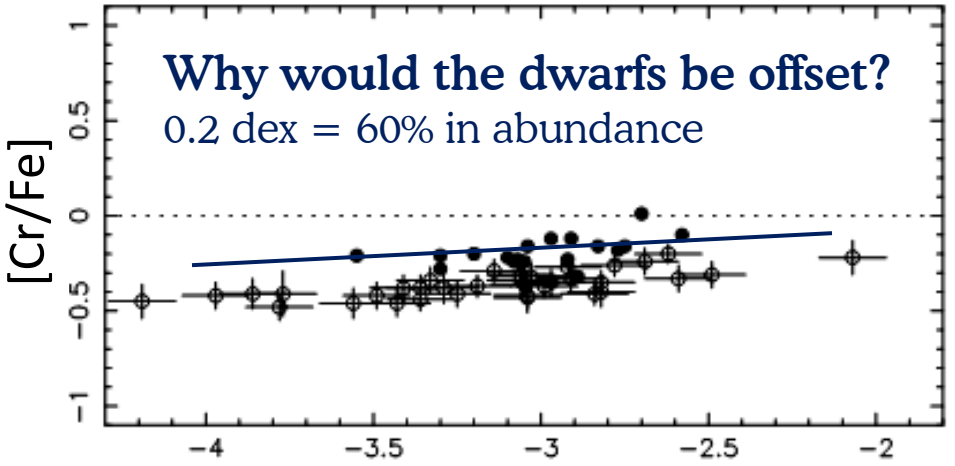
A great number of **assumptions** that will **impact** chemical abundances in **dwarfs and giants differently**:

- 1D vs. 3D
- LTE vs. non-LTE
- line-list completeness
- …

Each of these can easily produce 0.2 dex effects making valid conclusions regarding nucleosynthesis difficult.



Cayrel *et al.* (2004)



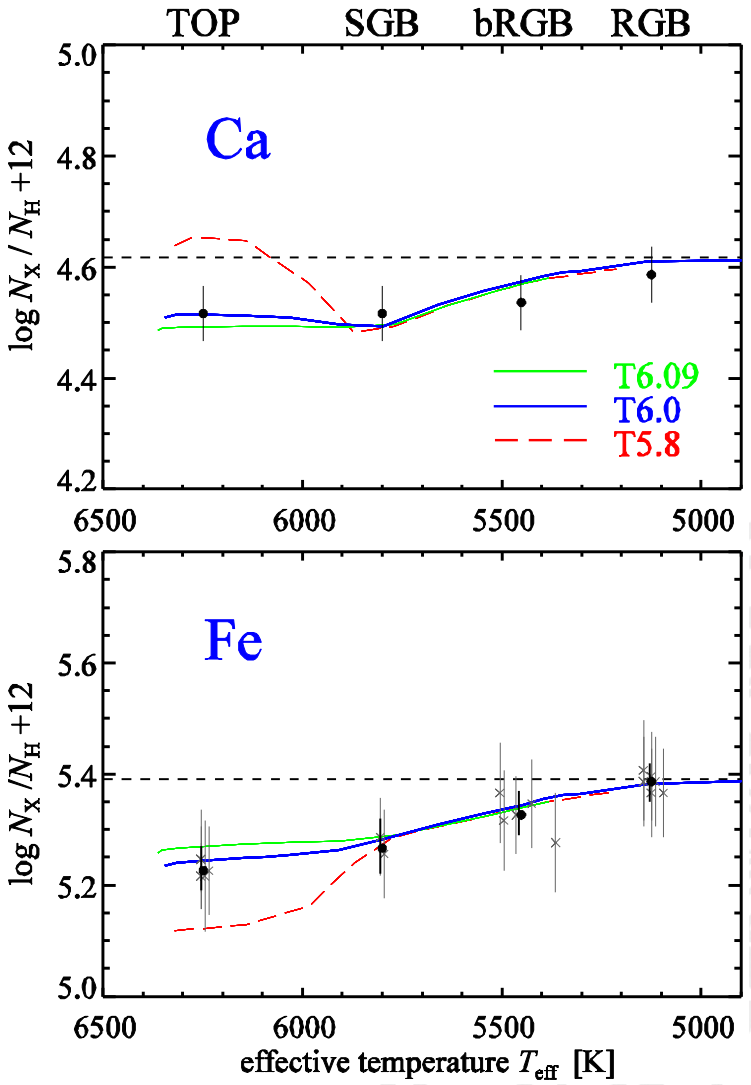
Bonifacio *et al.* (2009)

Unmodelled biases

In particular metal-poor dwarfs seem to suffer from **atomic diffusion** moderated by some form of mixing just below the convection zone.

At present, this **mixing** needs to be parameterized (Tx.x).
We do thus not know how stars of different metallicity are affected.

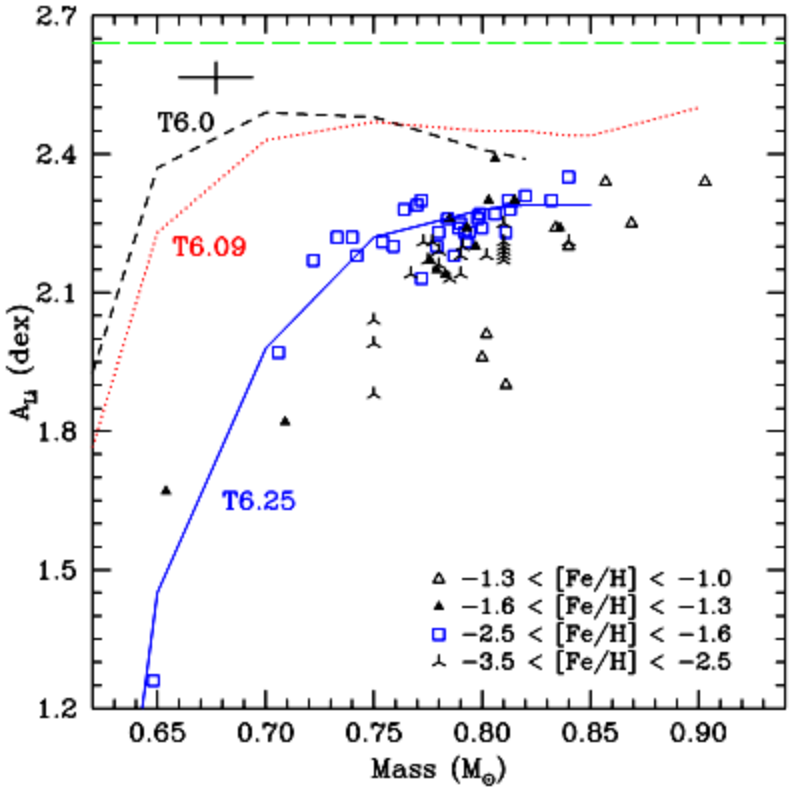
More work, both observational and theoretical, is needed here.



Another example

Based on accurate stellar parameters, Meléndez *et al.* (2009) look to the **Spite plateau of lithium** not on the customary [Fe/H] scale, but **on a stellar-mass scale**.

Finding: a trend of lithium depletion with stellar mass that is well-described by atomic diffusion and mixing, indicating an original (**primordial**) **lithium** abundance of **log ε(Li) = 2.64**.



Meléndez *et al.* (2009)

Wanted: a symbiosis

Stars in different evolutionary phases probe different aspects of stellar physics.

In order to fully exploit the harvest of current and upcoming all-sky surveys (e.g. Gaia), we have to **safeguard reliable analyses of stars across a range of luminosities**.

This will require us to develop stellar-structure and stellar-atmosphere modelling towards self-consistency.

Summary

Analyses of both ***Dwarfs and Giants*** are required for a comprehensive view of the chemical evolution of the Galaxy.

There are **still sizeable systematic errors** in analyses of mixed samples of stars that cloud our view of nucleosynthesis.

More sophisticated modelling is needed to overcome the remaining modelling biases.