

# Core Hydrogen Burning Red Supergiants in the Early Globular Clusters

**Dorottya Szécsi**

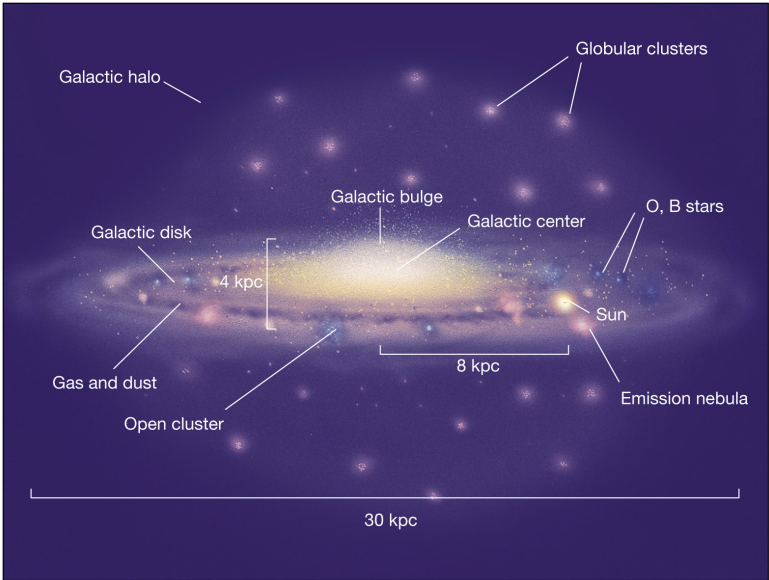
Jonathan Mackey  
Norbert Langer



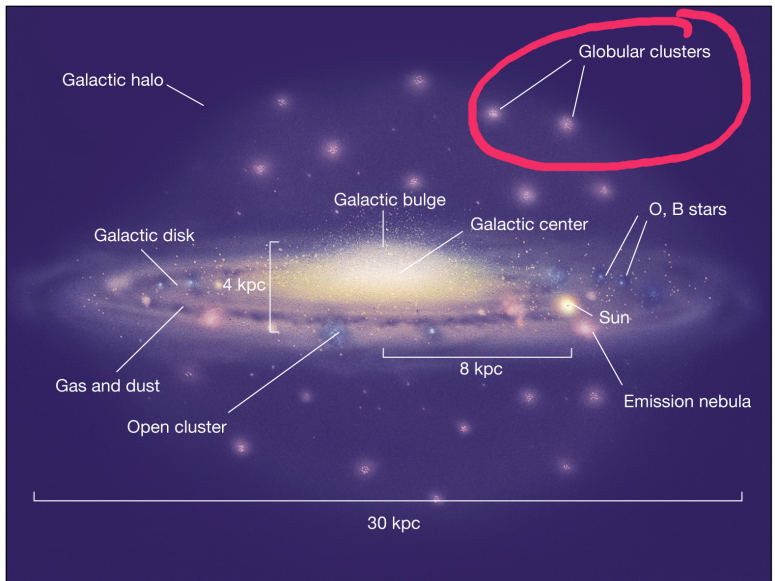
**Stellar Behemoths - Red Supergiants across the local Universe  
(IAU General Assembly FM 16)**

3-5. August 2015, Honolulu, Hawaii

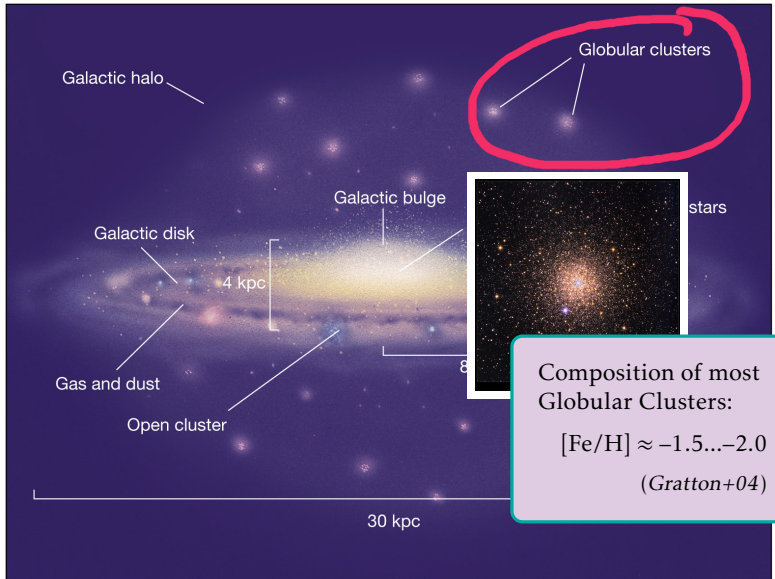
# Globular Clusters & Abundance Anomalies



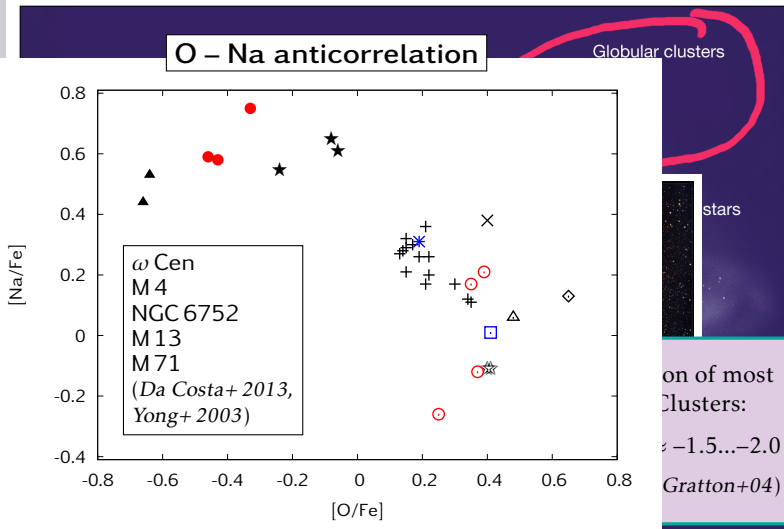
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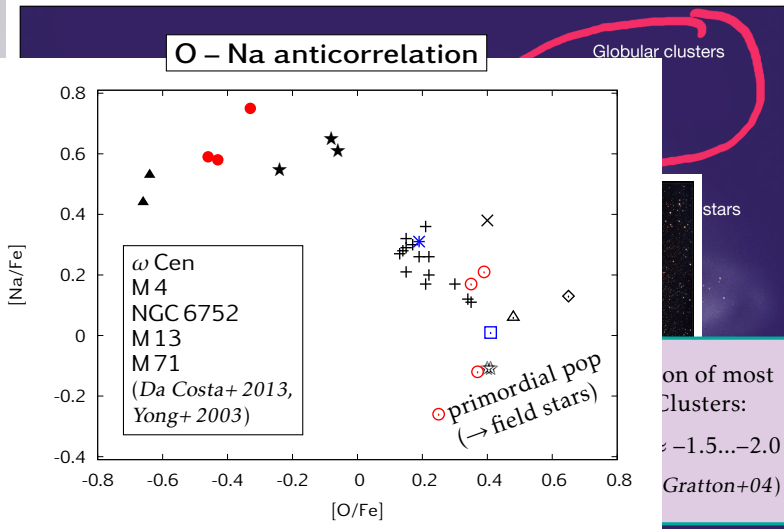
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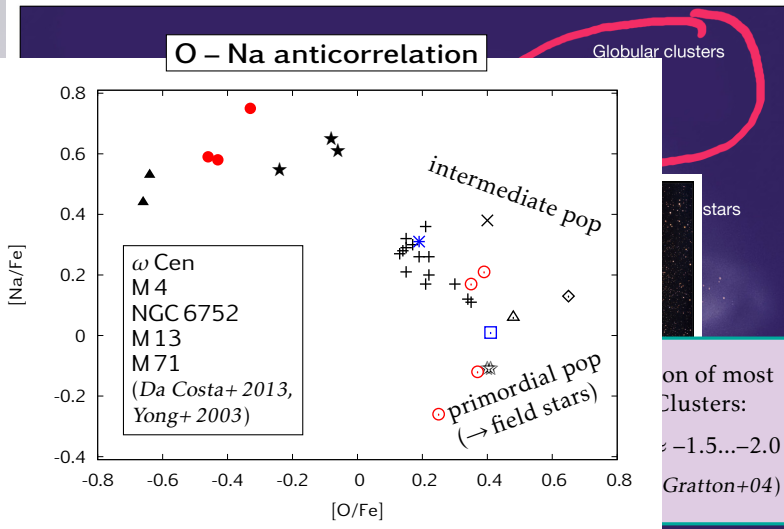
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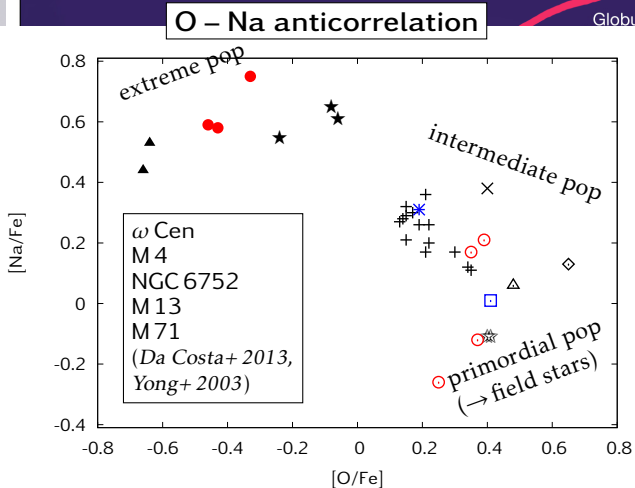
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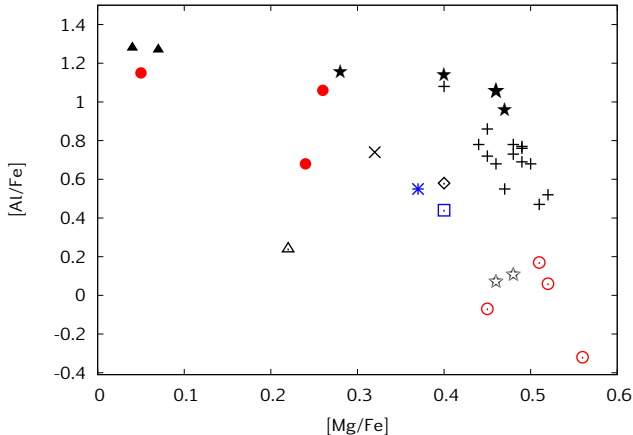
on of most  
Clusters:  
-1.5...-2.0  
(Gratton+04)





# Globular Clusters & Abundance Anomalies

## Mg - Al anticorrelation



Globular clusters

stars

on of most  
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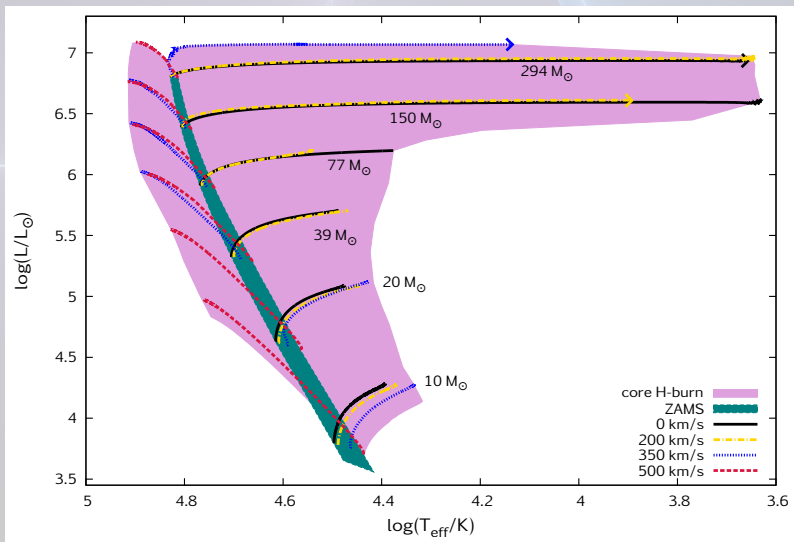
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→ **New scenario...**

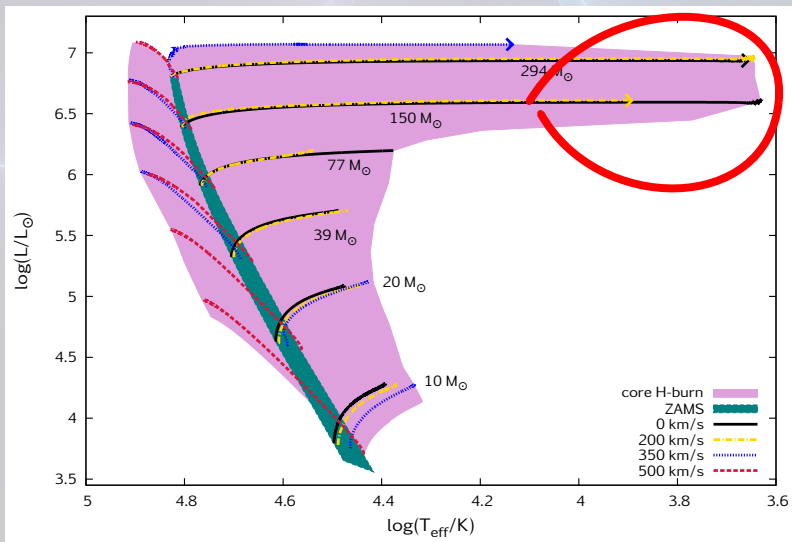
# Evolution of low metallicity massive stars

Szécsi et al. 2015 accepted to A&A



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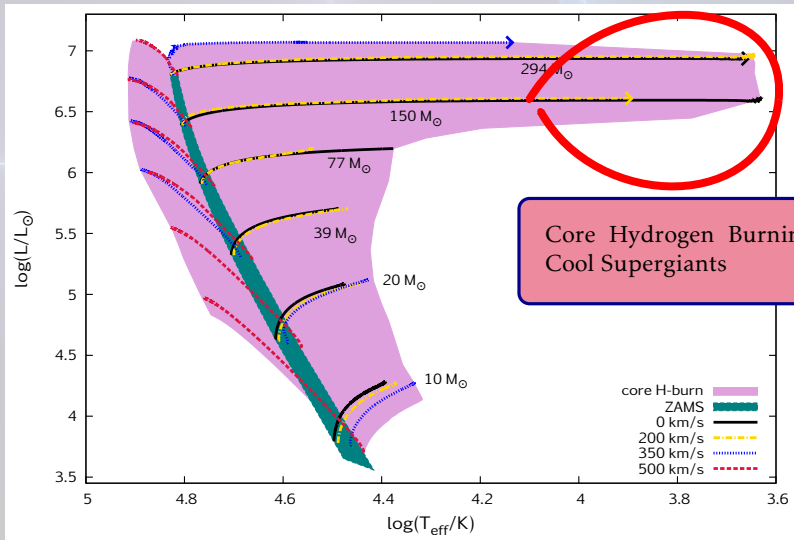
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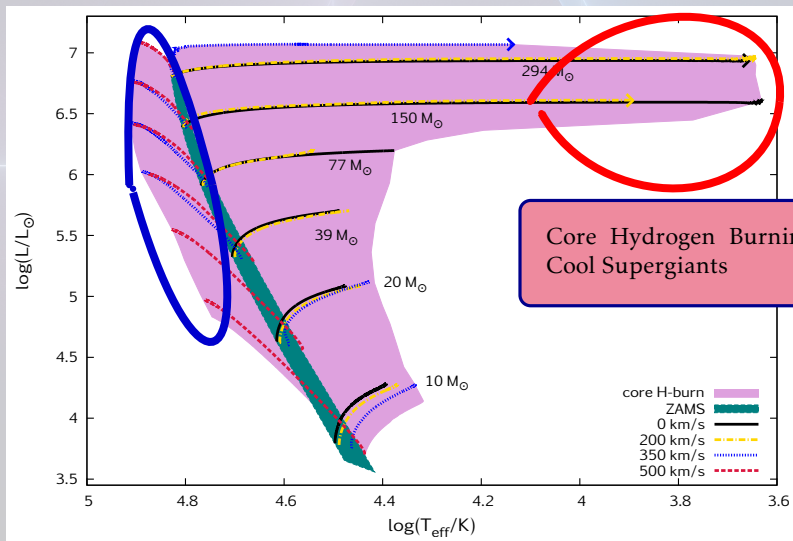
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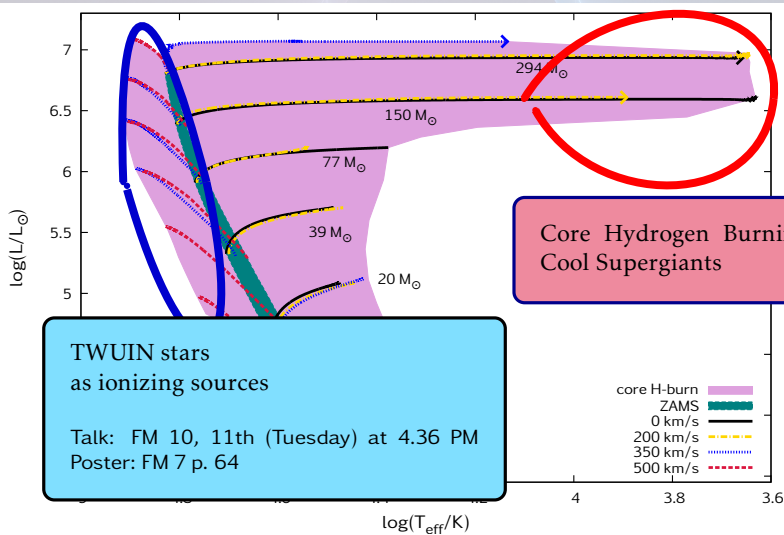
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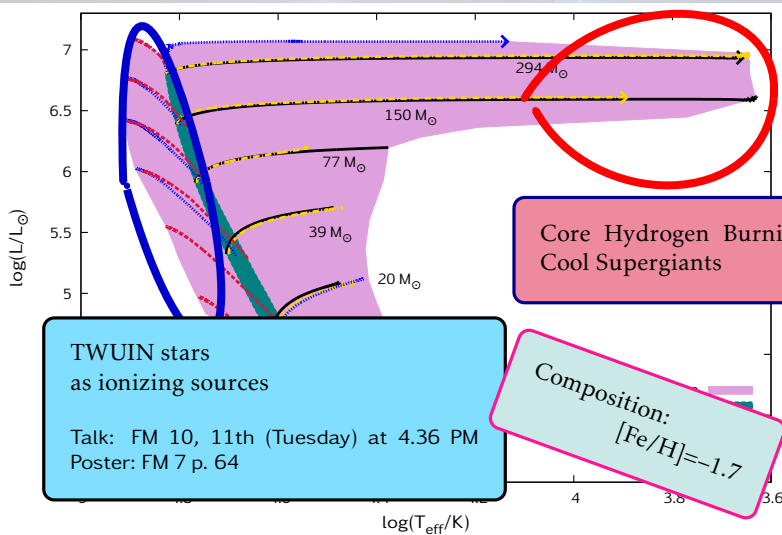
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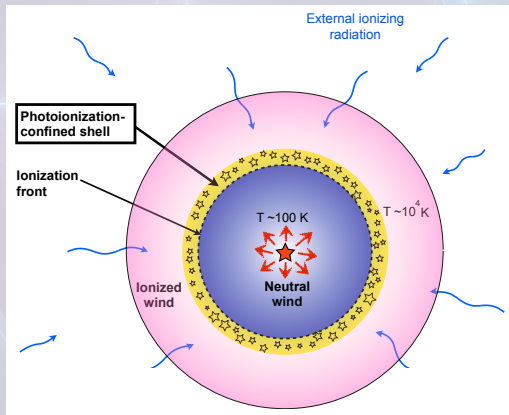
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The background features a large, semi-transparent circle in the upper center. A network of glowing, multi-colored lines (pink, blue, green, and purple) crisscrosses the scene, creating a complex, web-like pattern. A bright horizontal line of light passes through the center of the circle, with a small starburst effect at its intersection with the circle's edge. The overall aesthetic is futuristic and scientific.

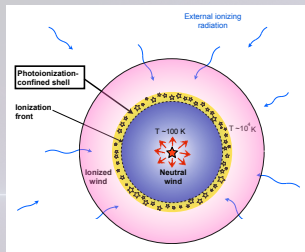
New scenario:  
**Starforming Supergiant Shells**

# New scenario: Starforming Supergiant Shells

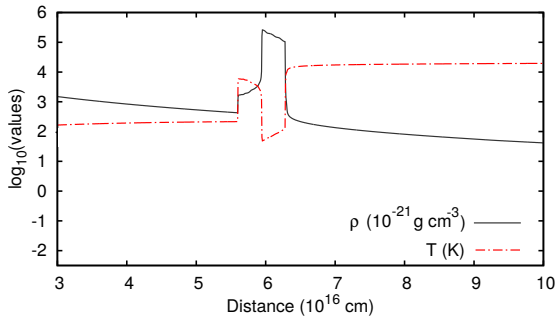
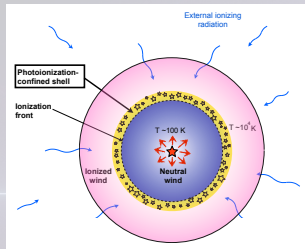


PICO shell: Mackey+ 2014 (*Nature*)

# Simulating the PICO shell

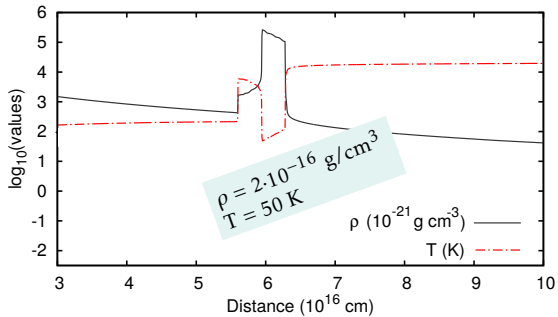
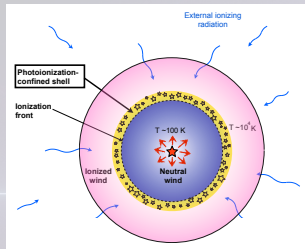


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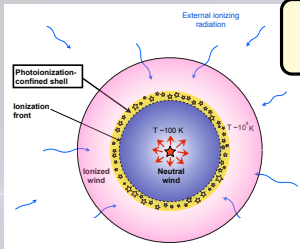




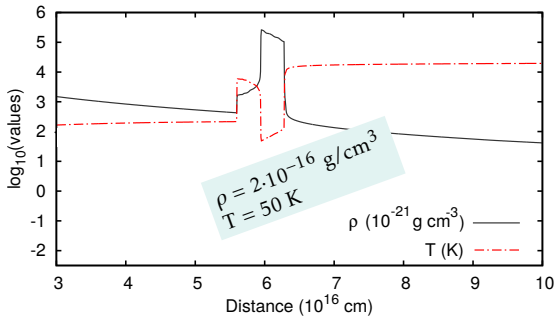
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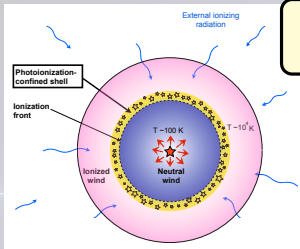
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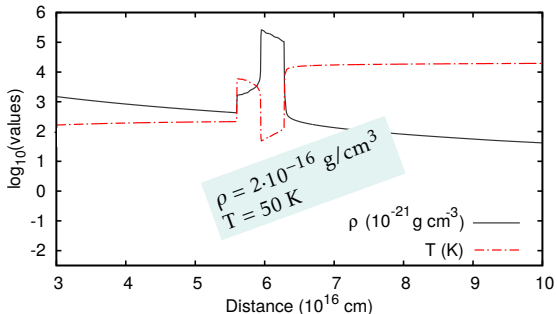
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Lifetime of the shell:  $\sim 10^5\text{ yr}$

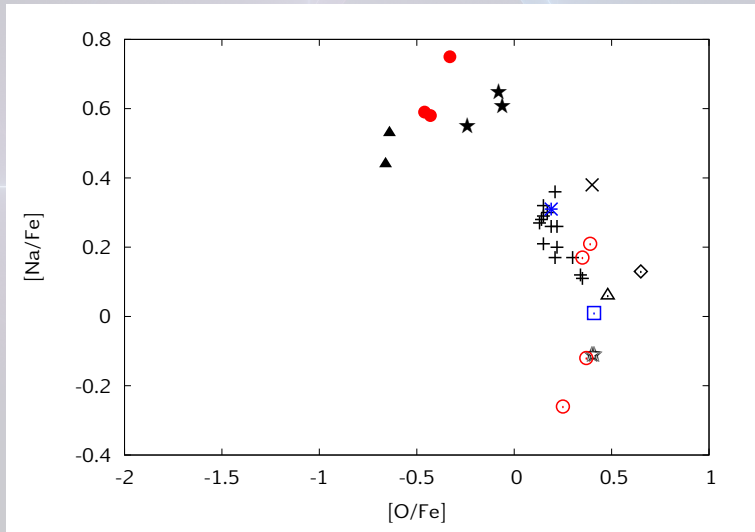
$\gg$

Growth timescale of grav. unstable perturbations:  $\sim 10^4\text{ yr}$

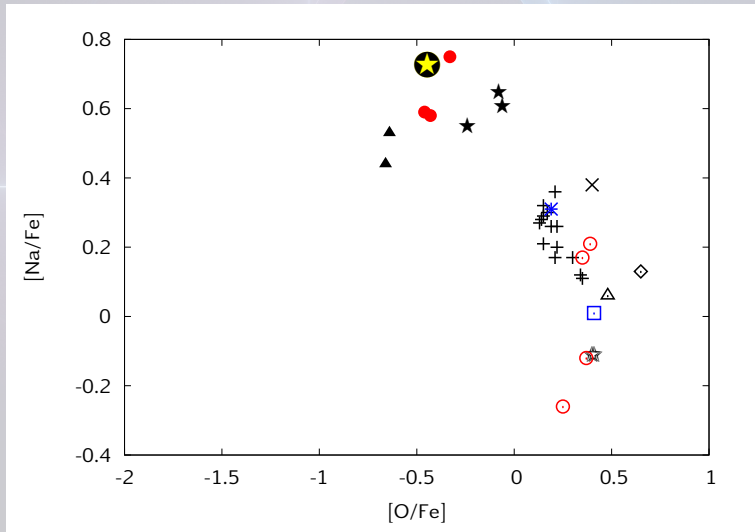
The background features a large, semi-transparent circle in the center. Overlaid on this and the entire slide are intricate, glowing patterns of thin, intersecting lines in shades of blue, cyan, and magenta. These lines form a complex, web-like structure that resembles a fractal or a network diagram. The overall aesthetic is futuristic and scientific.

Compared to observations:  
O – Na anticorrelation

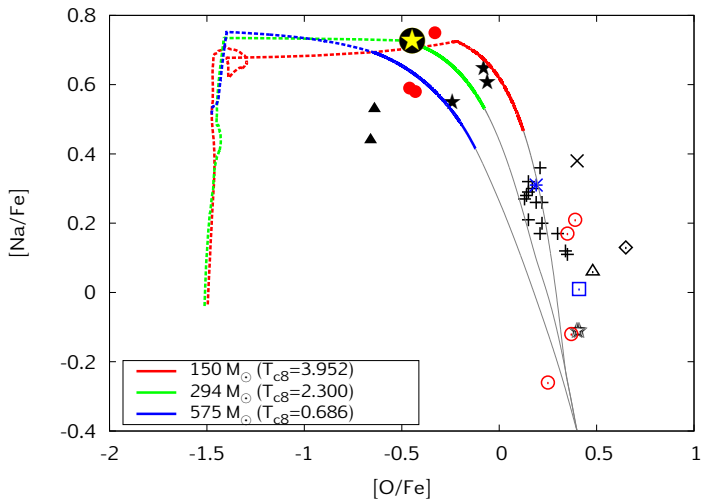
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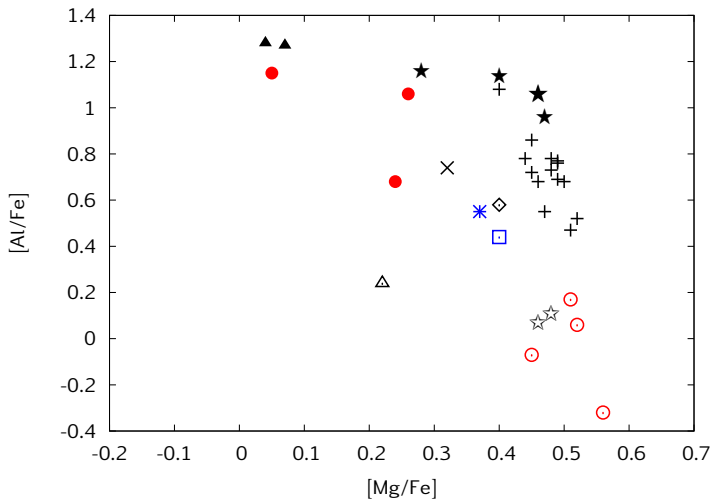


The background features a large, semi-transparent white circle centered on the page. Overlaid on this are several glowing, ethereal lines in shades of light blue and pink. These lines form a complex, web-like pattern that resembles a fractal or a network of connections. The lines vary in thickness and brightness, creating a sense of depth and movement. The overall aesthetic is clean, modern, and scientific.

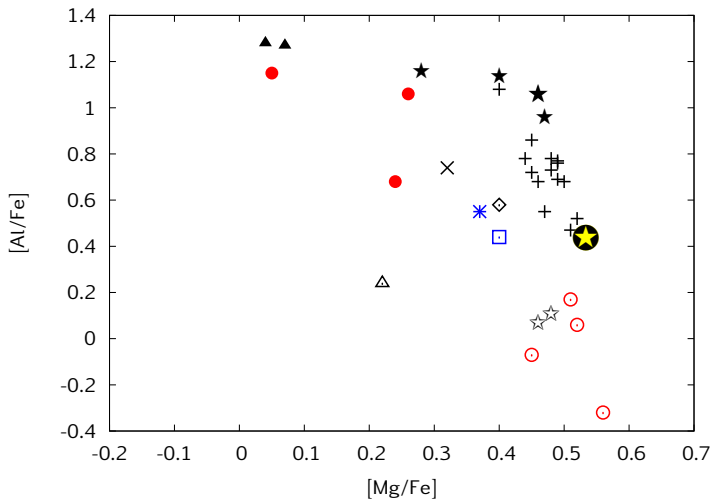
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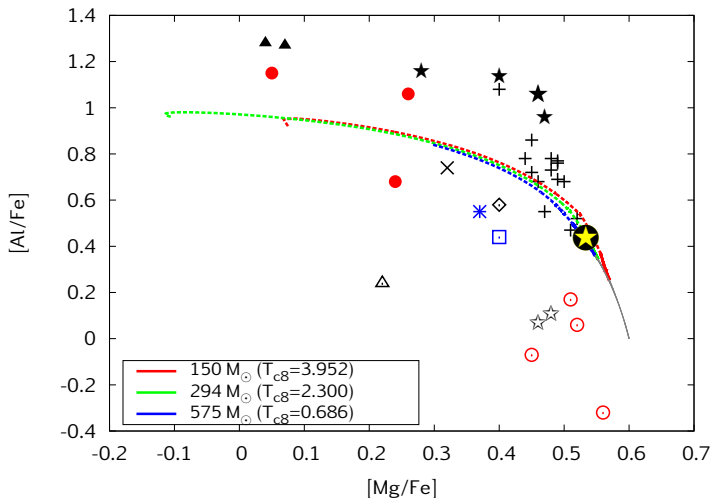
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- shell stability...

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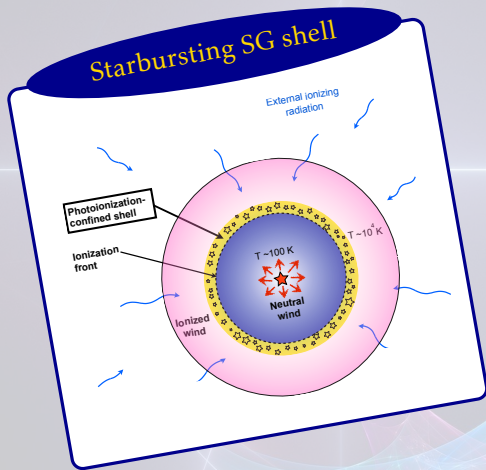
## RSGs as polluters

- at low-Z, core-H burning RSGs
- even without PICO shell: contributing to the general pollution of the GC!

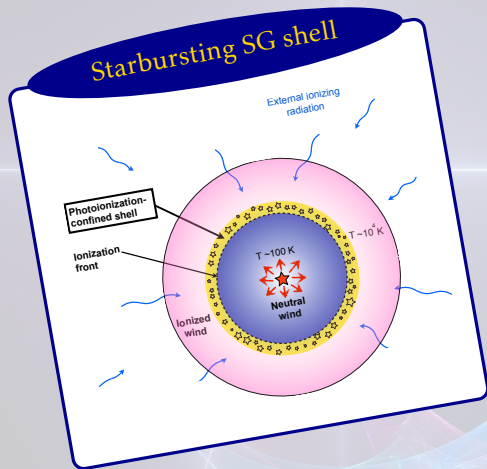
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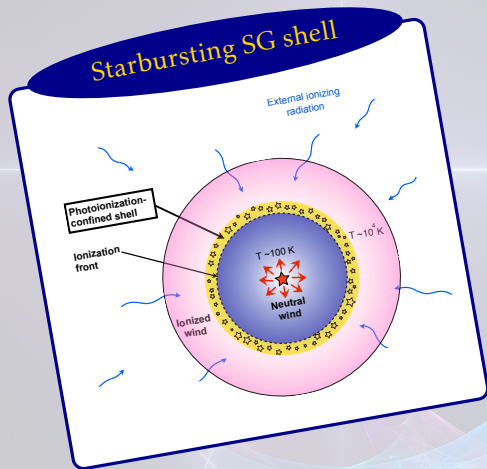
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- PICO shell around core-H burning cool/red SGs
- grav. unstable  $\rightarrow$  low-mass starformation
- simulated composition fits the 2nd generation stars
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A&A: Szécsi et al. 2015  
[arXiv:1506.09132]

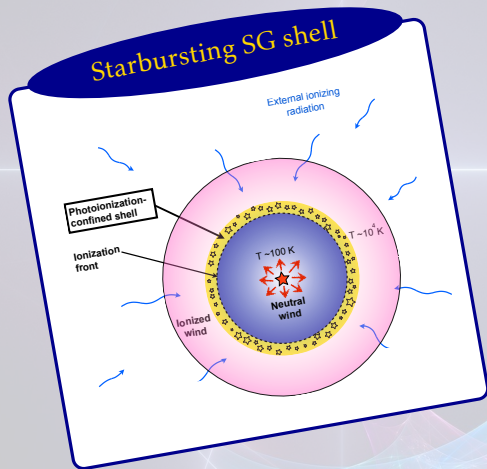
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Talk: 11th Tuesday at 4:36 PM  
at FM 10

Poster: FM 7 p. 64

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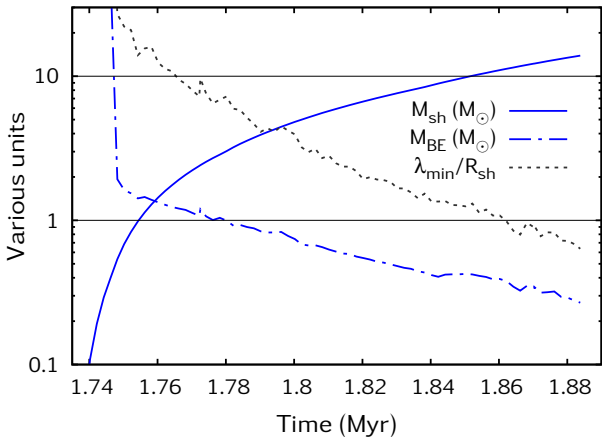
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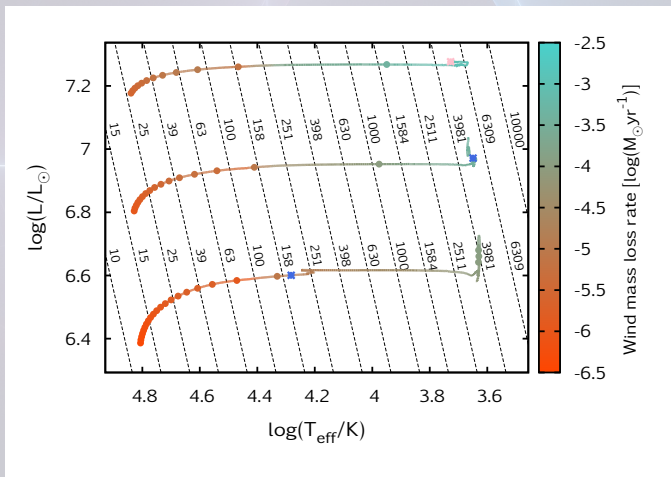
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Open to suggestions, comments and questions!

## Appendix: Time evolution of the shell



# Appendix: HR diagram of core-H burning RSGs



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