

Metal-poor massive stars

What are they? Why to care? And... how can we find them?

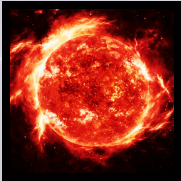
Dorottya Szécsi

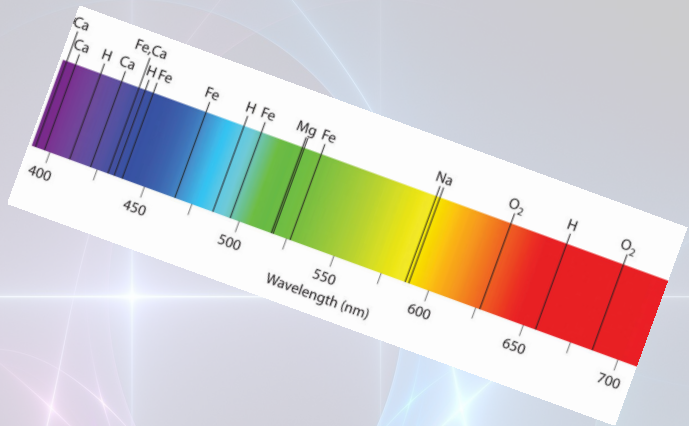
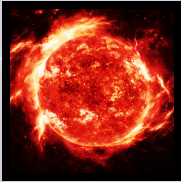
*Assistant Professor
Nicolaus Copernicus University*



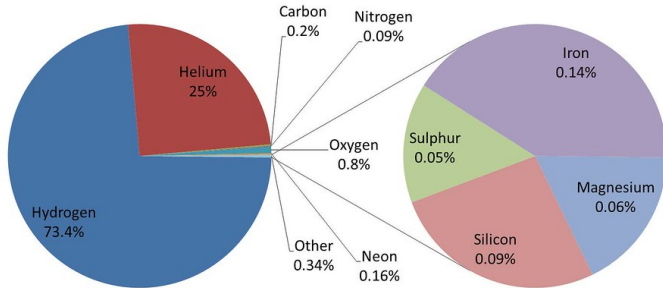
Astronomy Student Association Meeting
10th November 2020, Toruń



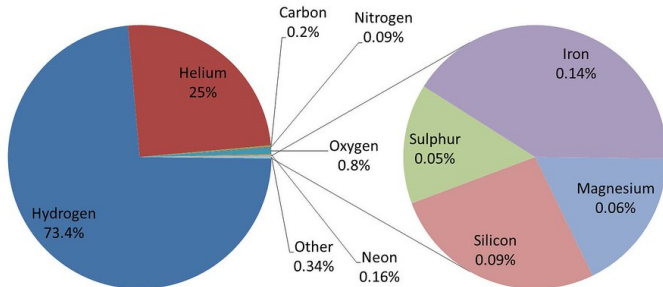




The Sun's composition



The Sun's composition

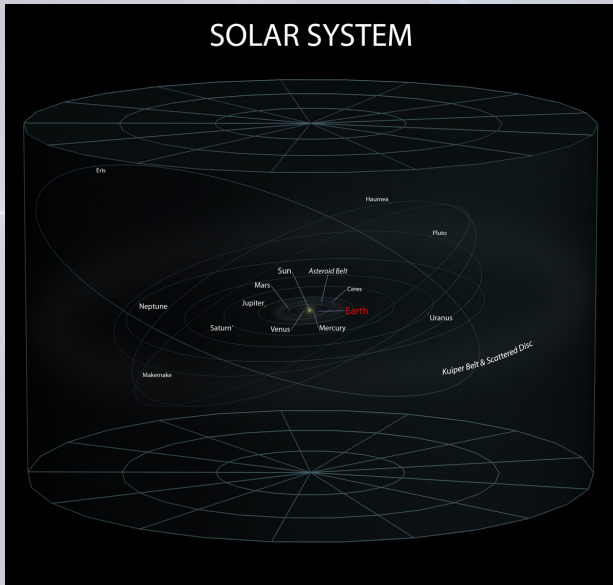


Less than 2% heavy elements,
i.e. *high* metal content, *metal-rich*

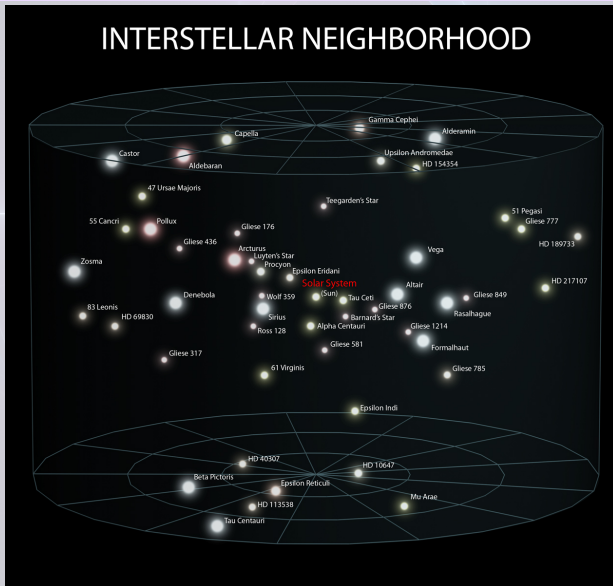
The Universe is pretty large though...



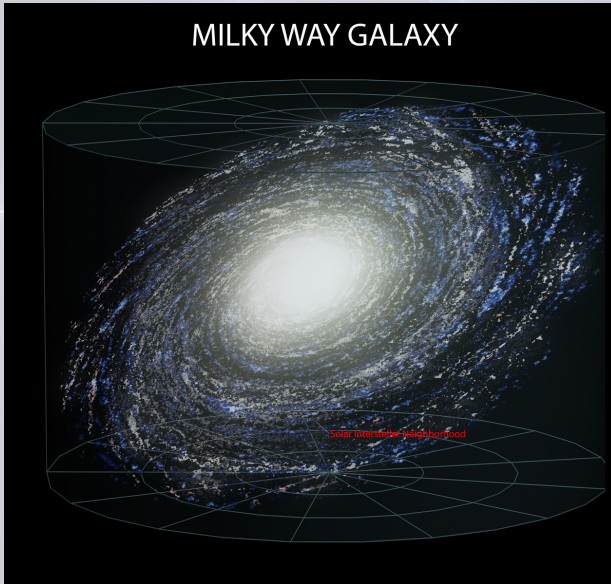
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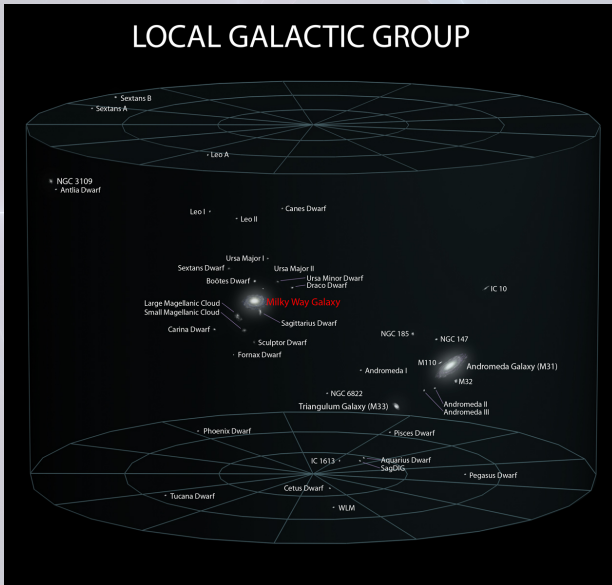


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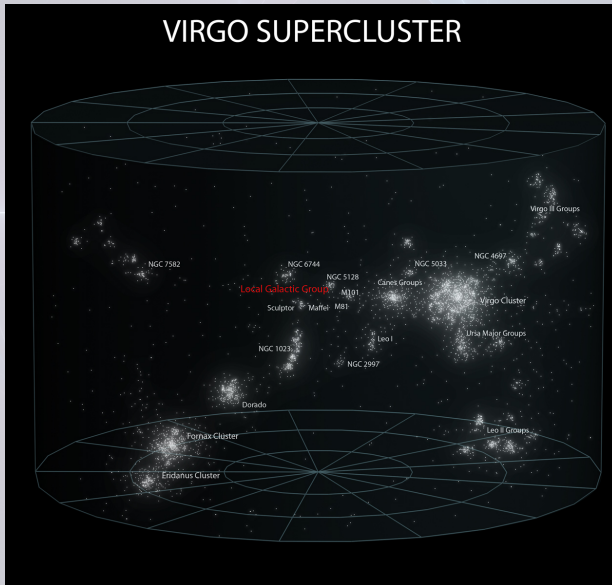


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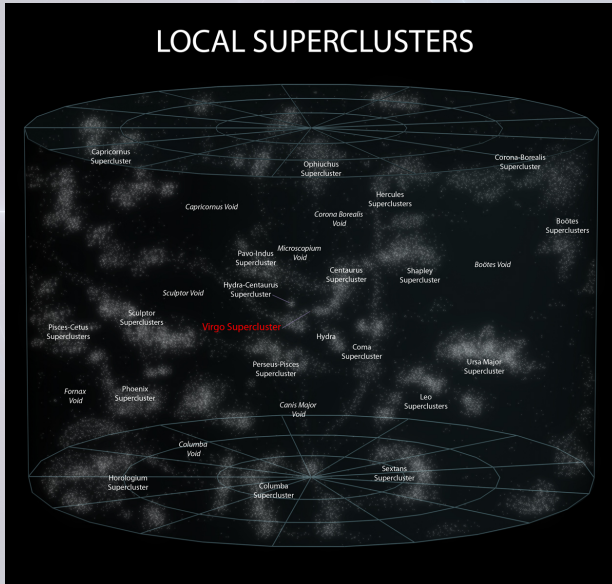
LOCAL GALACTIC GROUP



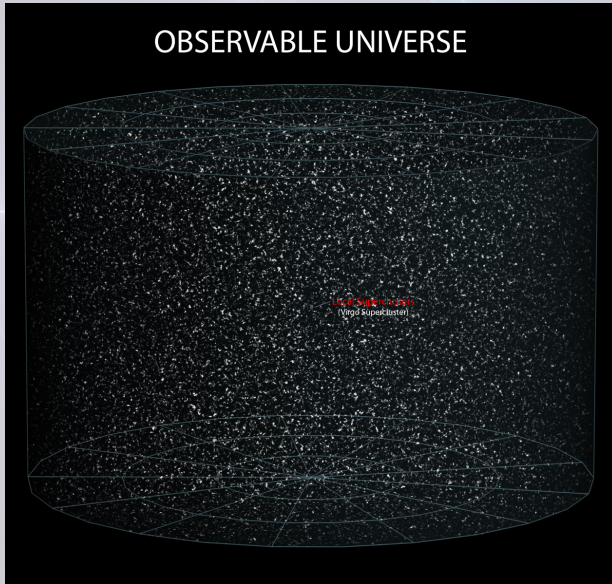
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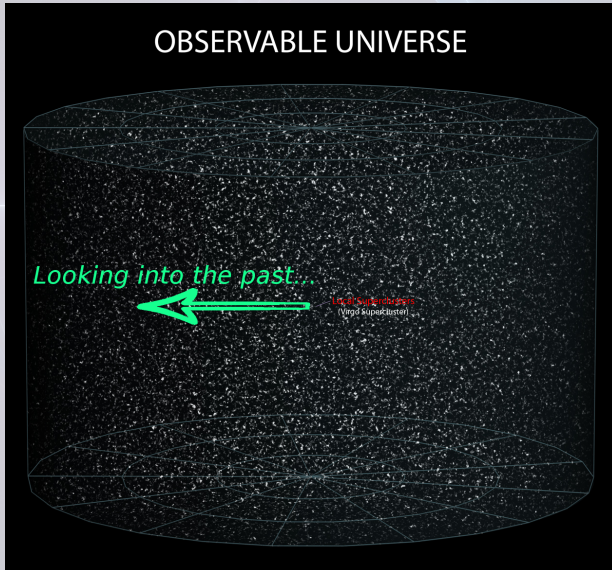
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Metal-poor *massive* stars... theory



Metal-poor *massive* stars... theory

massive: > 8 times the Sun

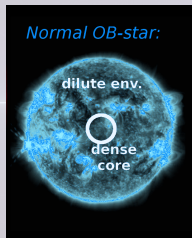
– rare but influential



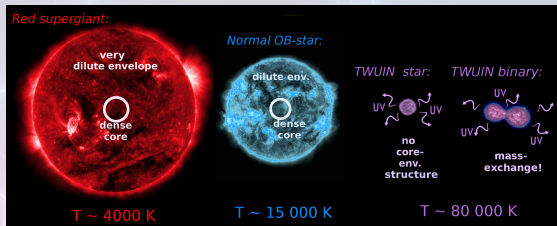
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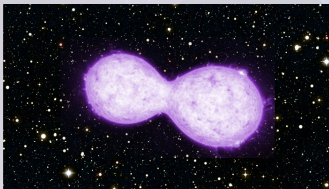
Metal-rich



Metal-poor: new stars predicted!

e.g. [Szécsi+15](#), [Szécsi+18](#), [Szécsi+19](#)

Gravitational waves... theoretical origin!



e.g. [Szécsi'17a](#)

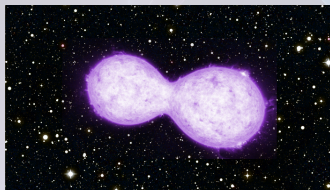
[Szécsi'17b](#)

Bagoly,[Szécsi+16](#)

Marchant+16,17

Gravitational waves... theoretical origin!

Life



Massive binaries

e.g. [Szécsi'17a](#)

[Szécsi'17b](#)

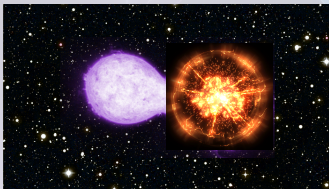
Bagoly,[Szécsi+16](#)

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Massive binaries

Explosions

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[Szécsi'17b](#)

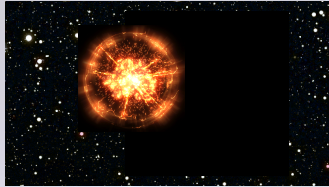
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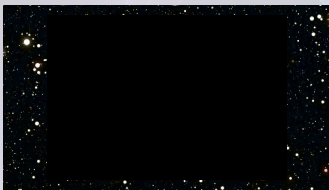
Marchant+16,17

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Life

Death

Afterlife



Massive binaries

Explosions

2 Black Holes
(or Neutron Stars)

e.g. [Szécsi'17a](#)

[Szécsi'17b](#)

Bagoly,[Szécsi+16](#)

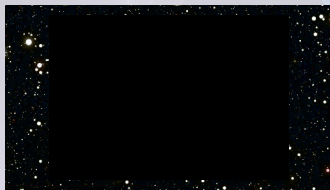
Marchant+16,17

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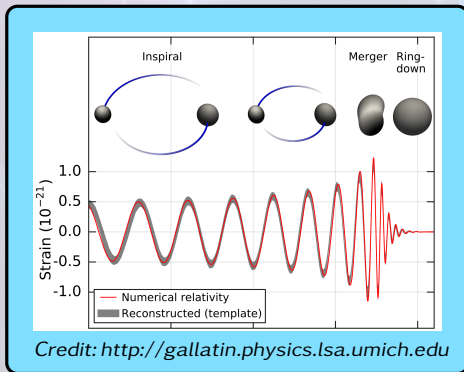
**'Second
death'**

e.g. [Szécsi'17a](#)

[Szécsi'17b](#)

[Bagoly,Szécsi+16](#)

[Marchant+16,17](#)



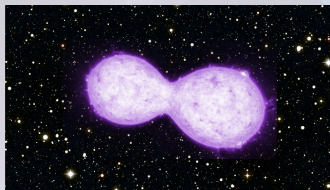
Merger

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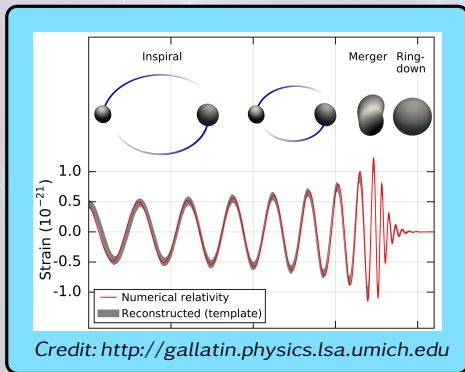
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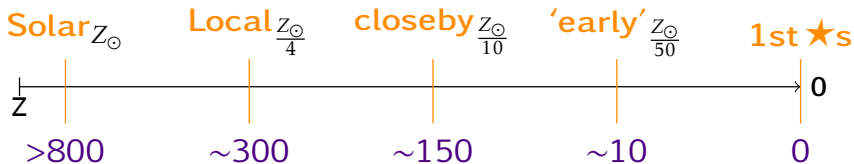
The background features a complex, glowing fractal pattern. It consists of numerous overlapping, semi-transparent lines and shapes in shades of light blue, pink, and green. These elements create a sense of depth and movement, resembling a digital or organic structure. A large, faint circular shape is visible in the upper center, partially obscured by the fractal lines. The overall effect is ethereal and futuristic.

However...

Metal-poor *massive* stars... observations??



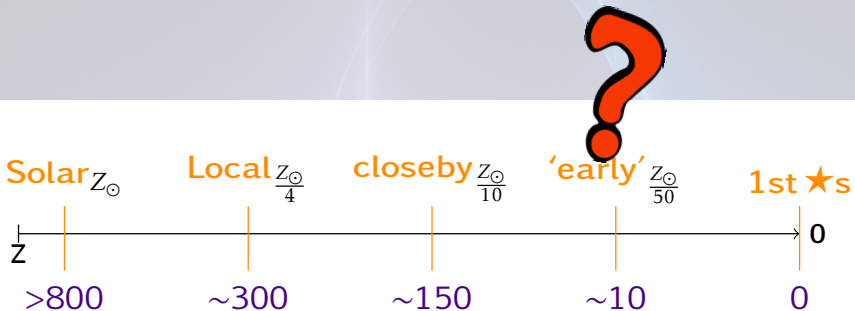
Metal-poor *massive* stars... observations??



spectroscopy
(i.e. direct evidence)

e.g. Castro+14,+18, Ramírez-Agudelo+17, Kubátová&[Szécsi](#)+18

Metal-poor *massive* stars... observations??



spectroscopy
(i.e. direct evidence)

Gravitational wave theories...

e.g. Castro+14,+18, Ramírez-Agudelo+17, Kubátová&[Szécsi](#)+18

The background features a large, semi-transparent white circle centered on the page. Overlaid on this and the entire background are intricate, glowing patterns of thin, curved lines in shades of light blue, cyan, and magenta. These lines intersect to form a complex, web-like structure that resembles a stylized molecular or network diagram. The overall aesthetic is clean, modern, and scientific.

My research

My research

Dr. Dorottya Szécsi, NCU, Toruń

