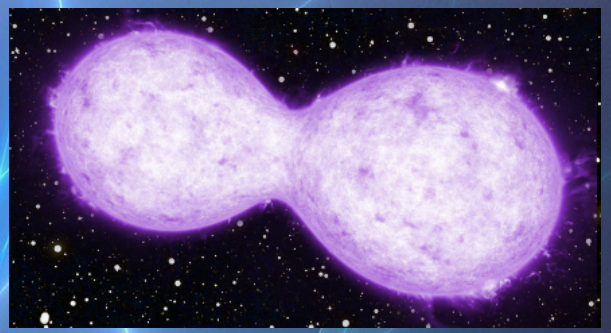
Metal-poor massive stars

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

Dorottya Szécsi

Assistant Professor

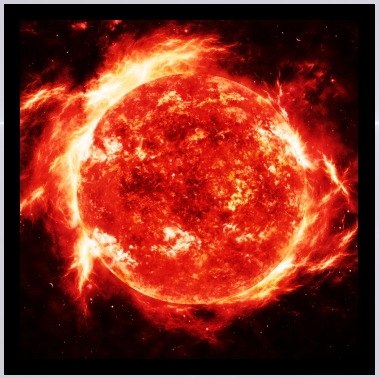
Nicolaus Kopernicus University



Astronomy Student Association Meeting

10th November 2020, Toruń

Big
Dipper



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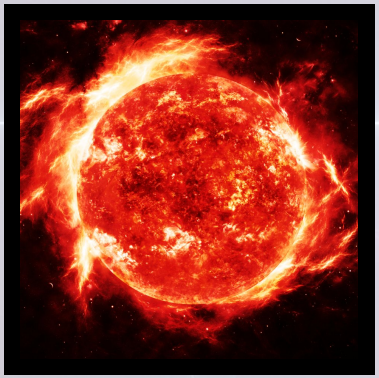
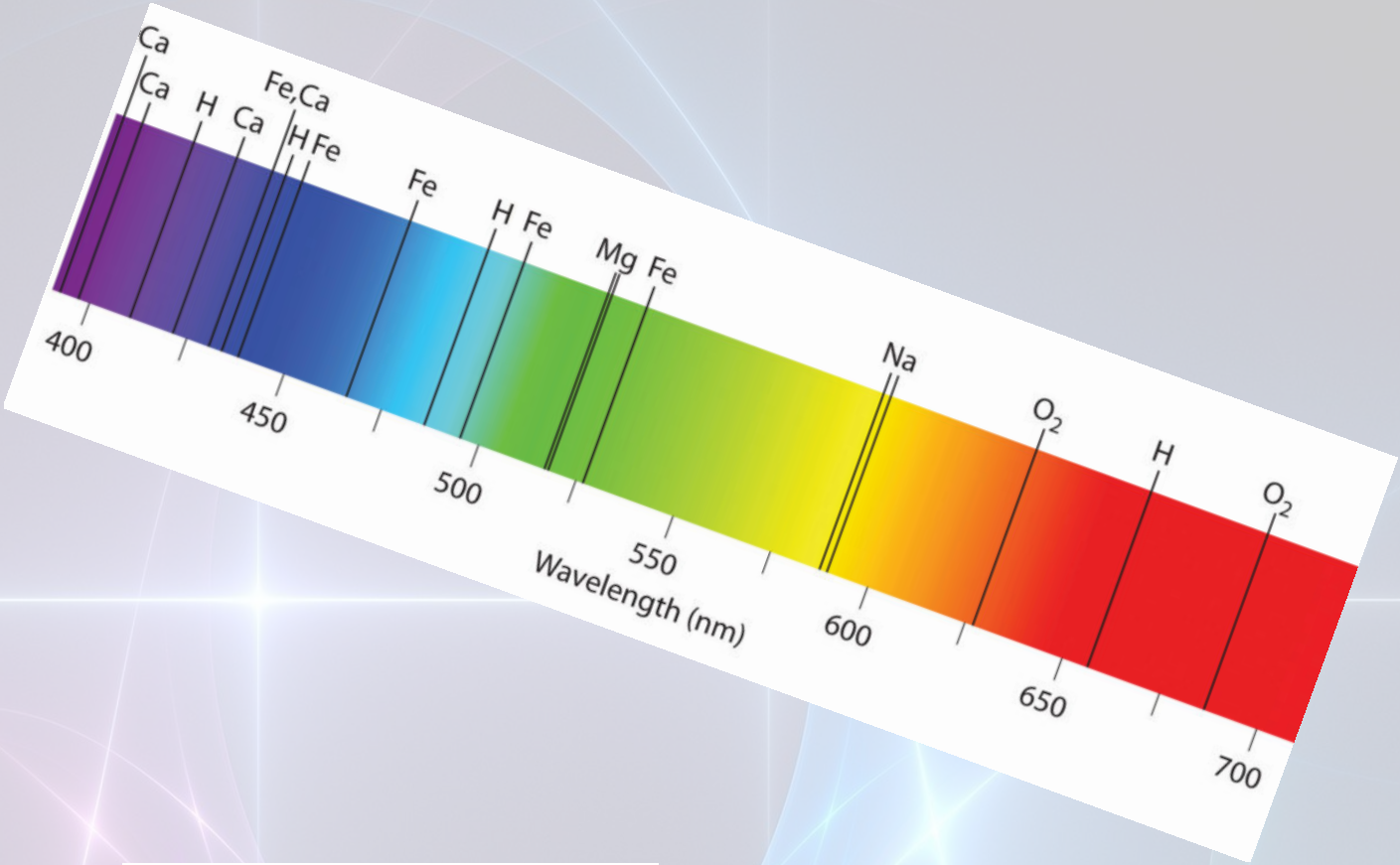
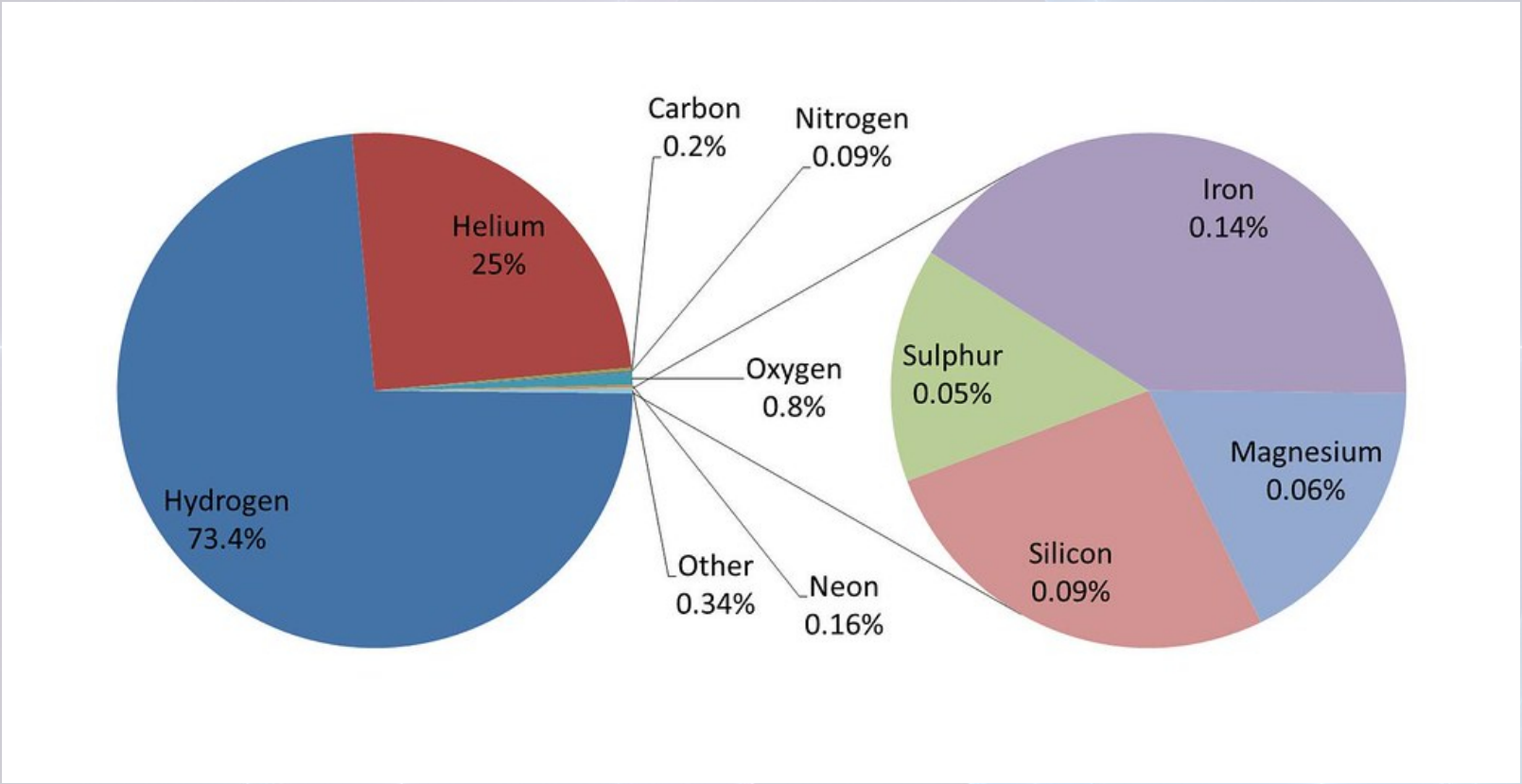



Ca
Ca
H
Ca
Fe,Ca
H
Fe
Fe
H
Fe
Mg
Fe
Na
O2
H
O2
400
450
500
550
600
650
700
Wavelength (nm)

The Sun's composition



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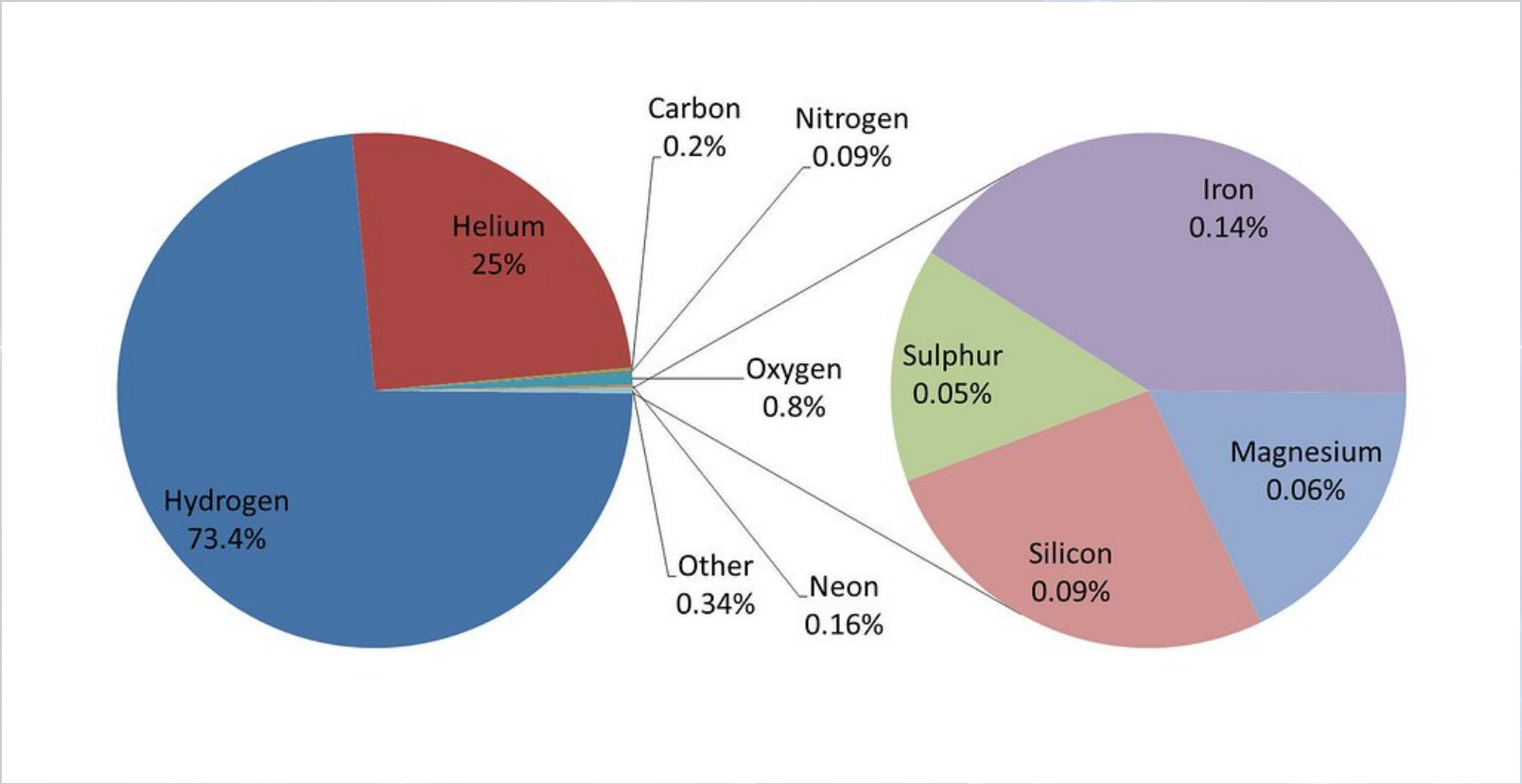

Less than 2% heavy elements,
i.e. *high* metal content, metal-*rich*

The Universe is pretty large though...

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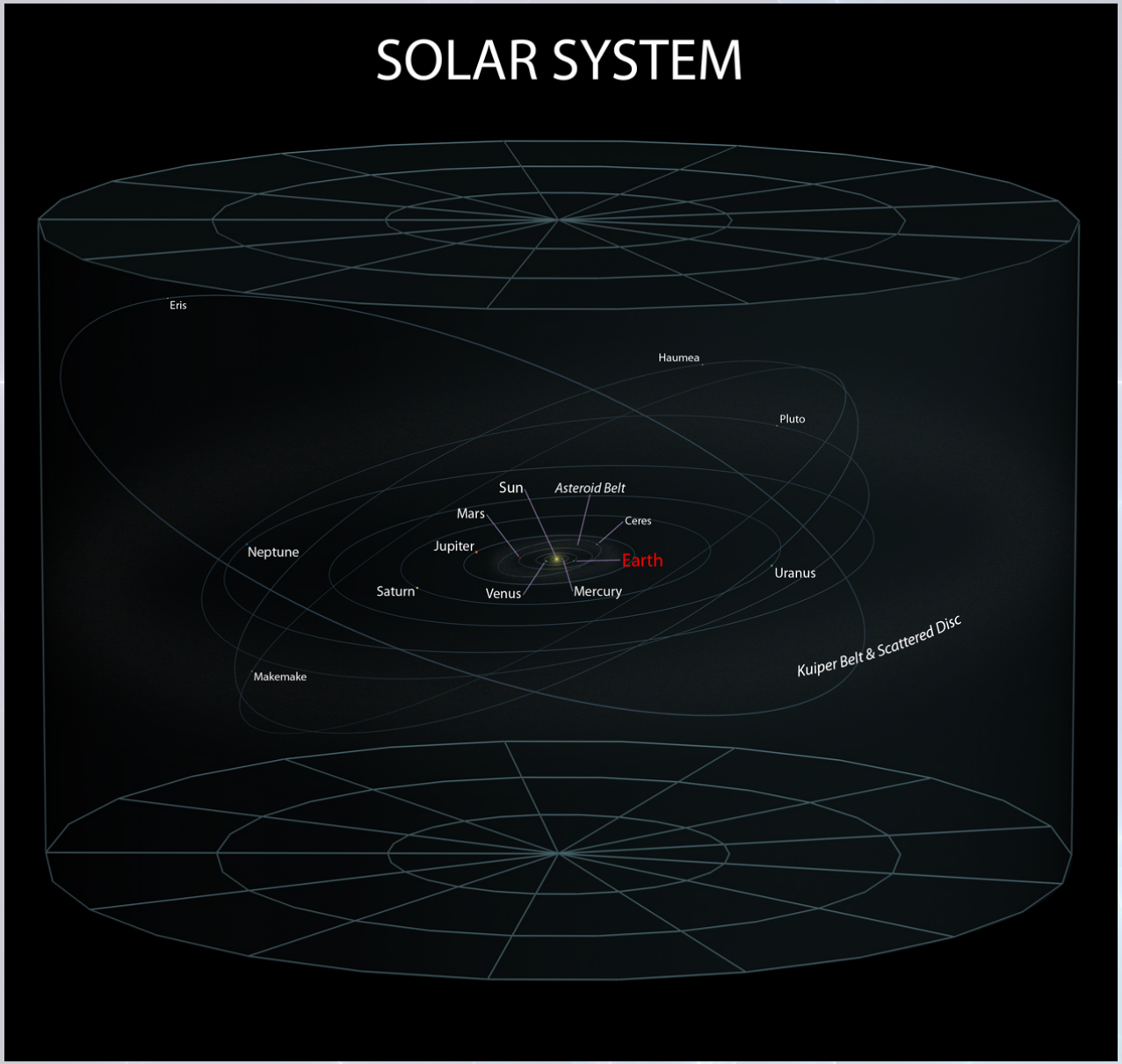

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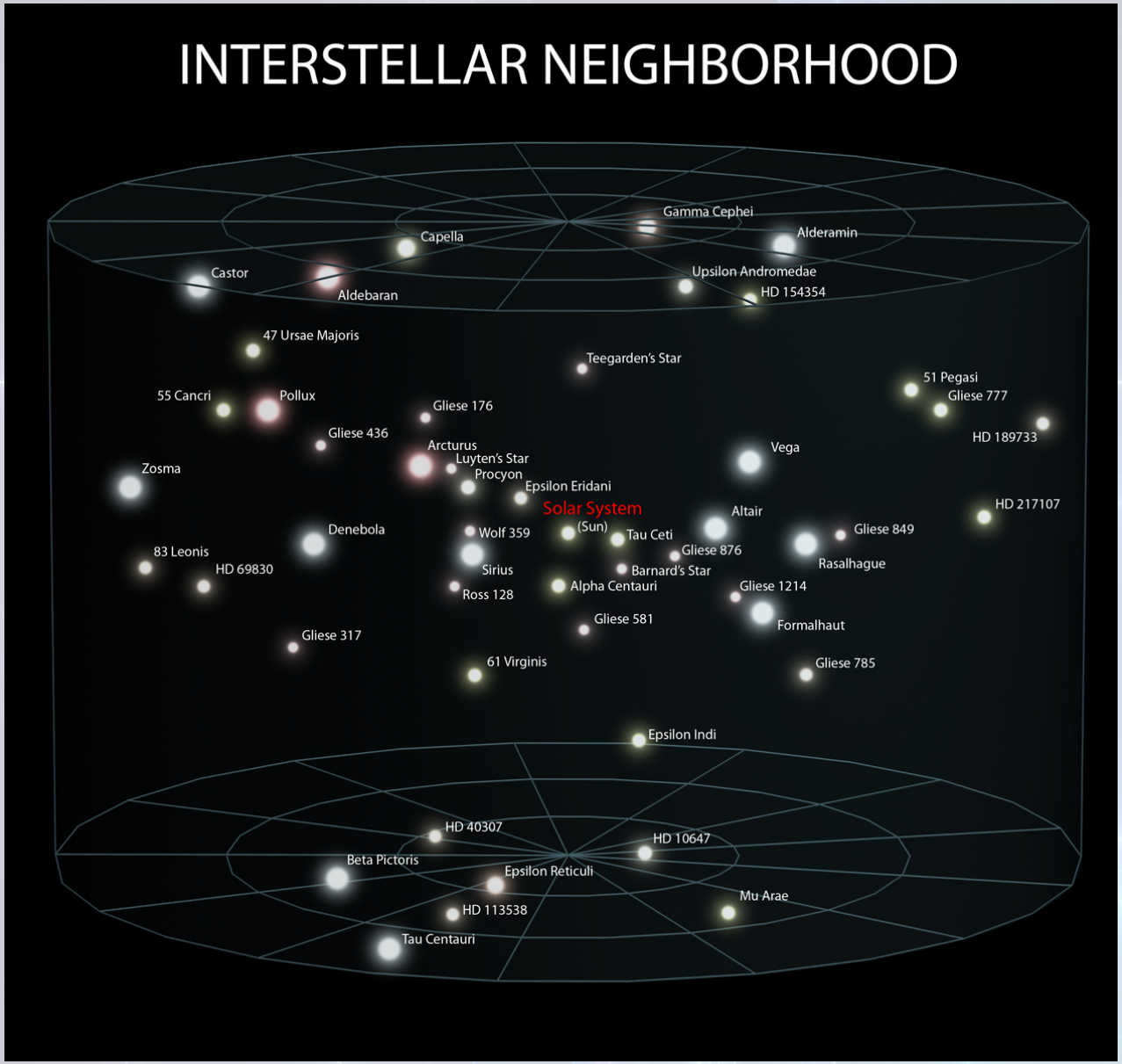

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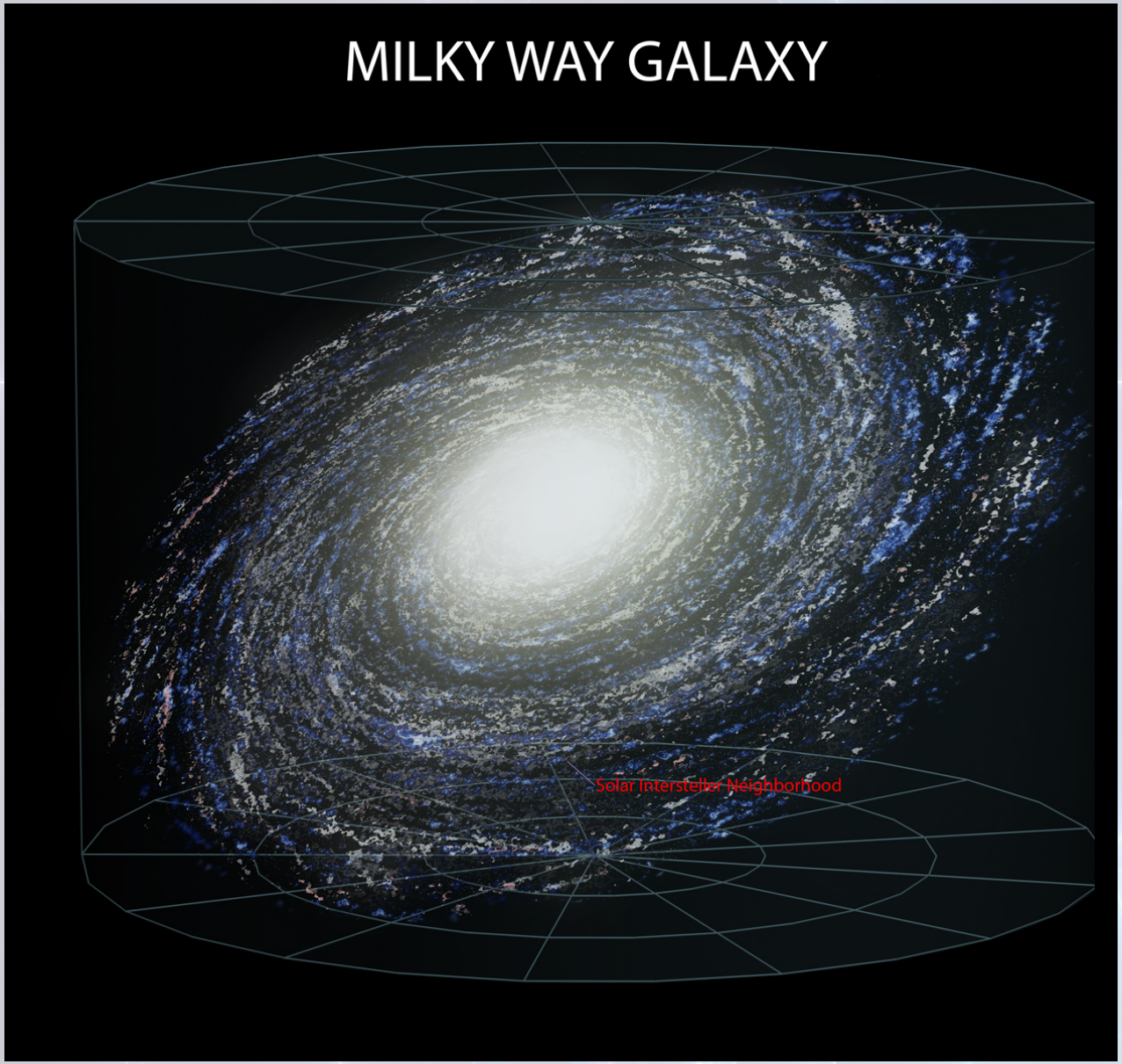

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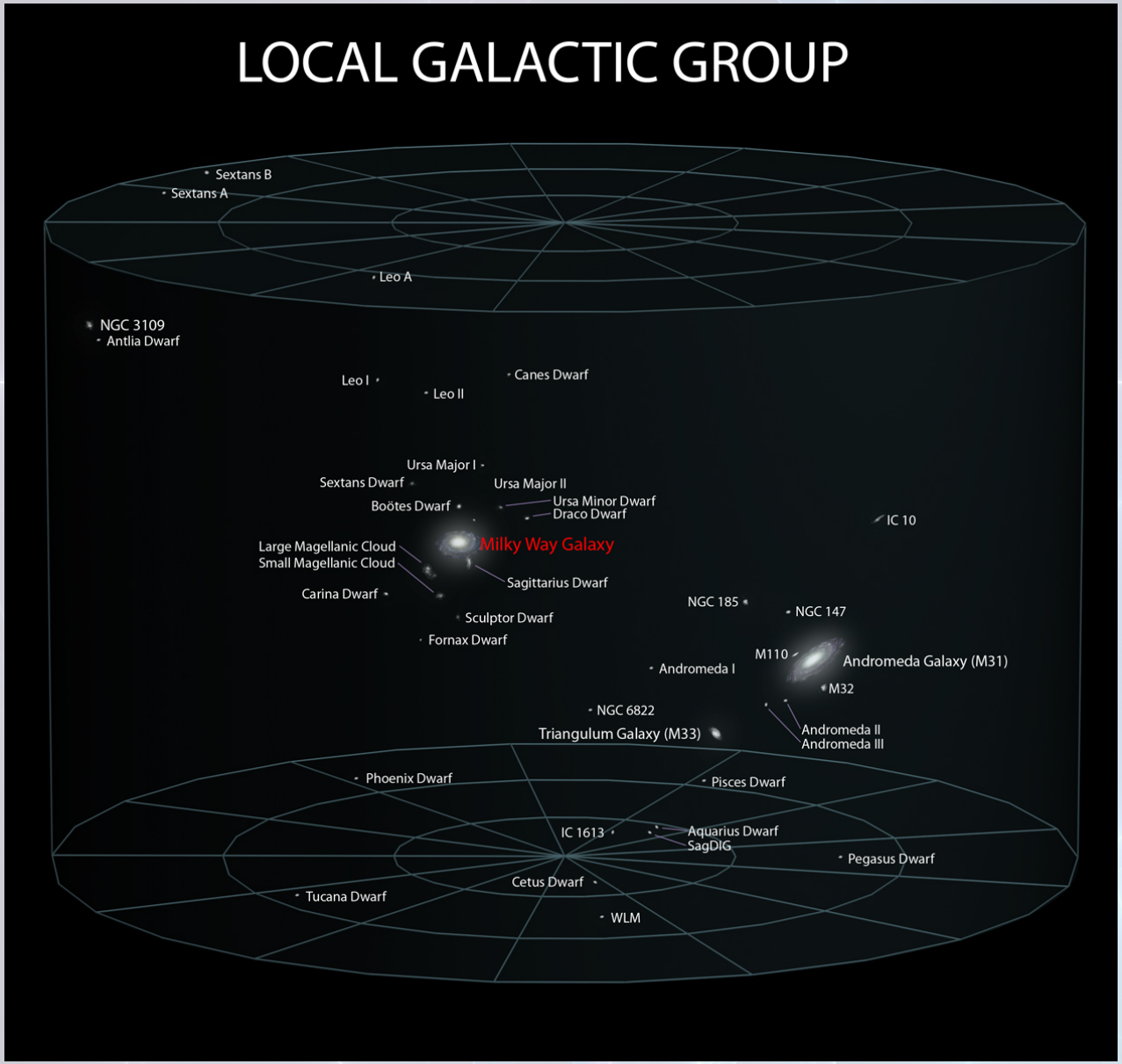

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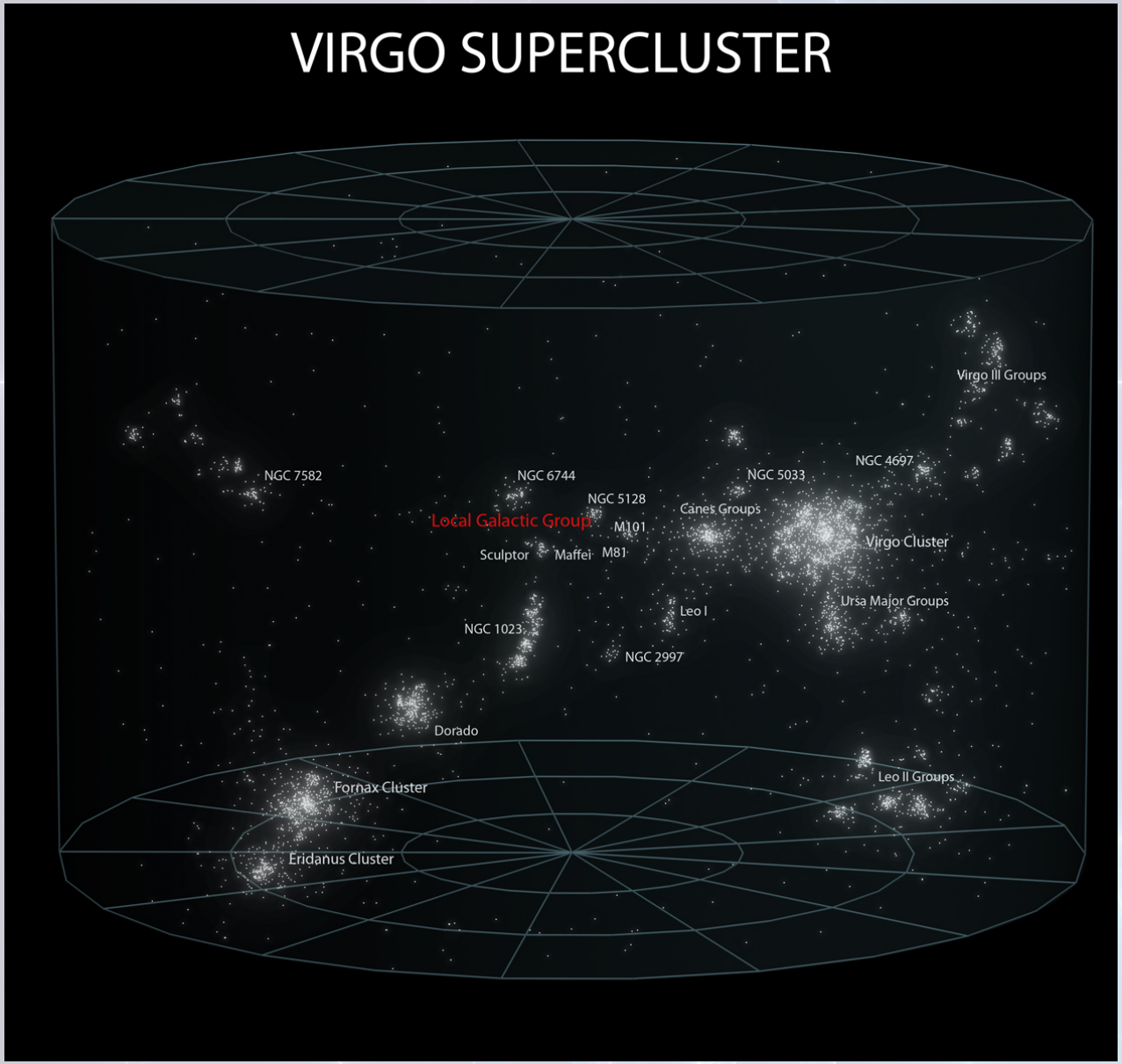

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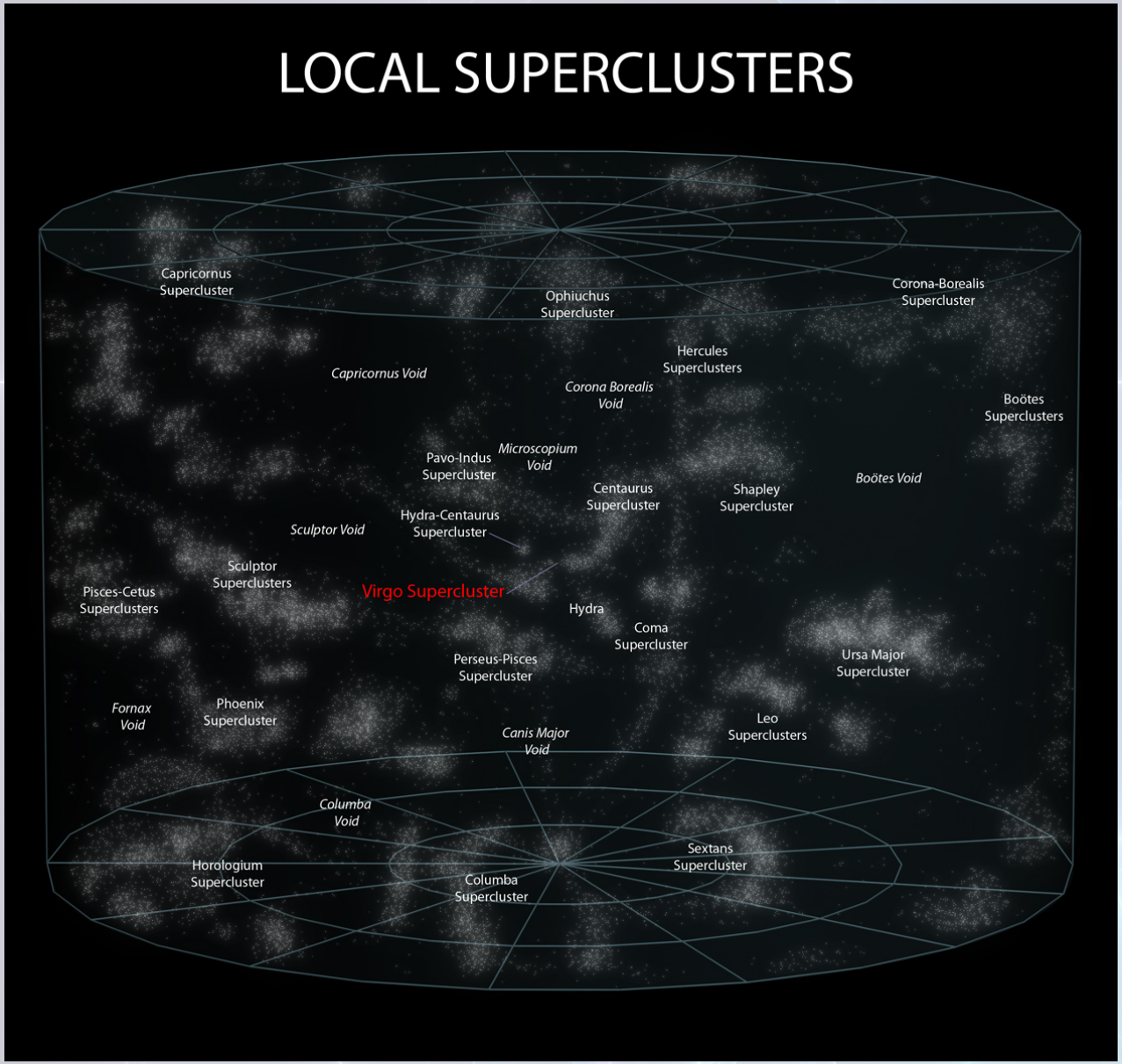

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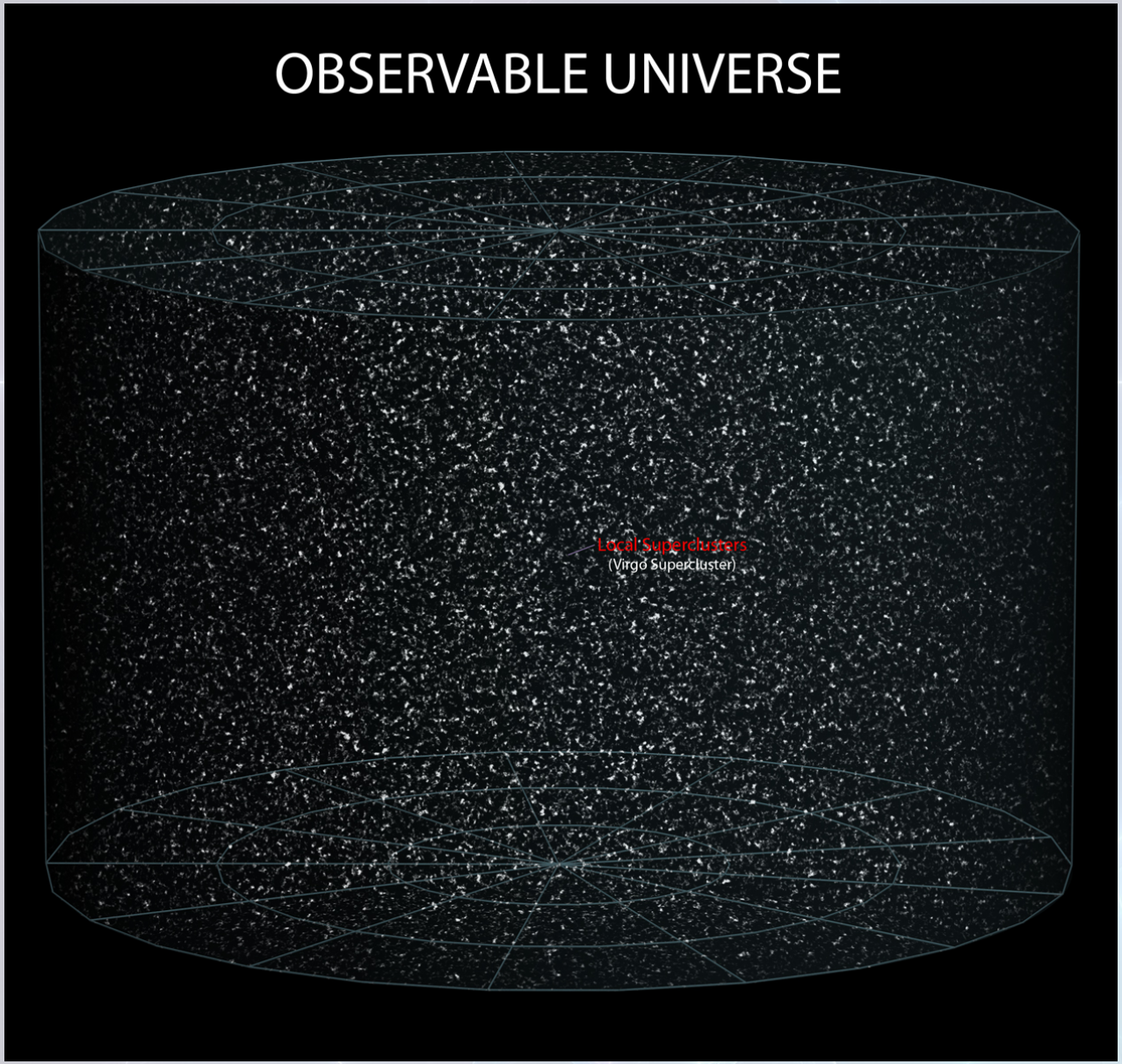

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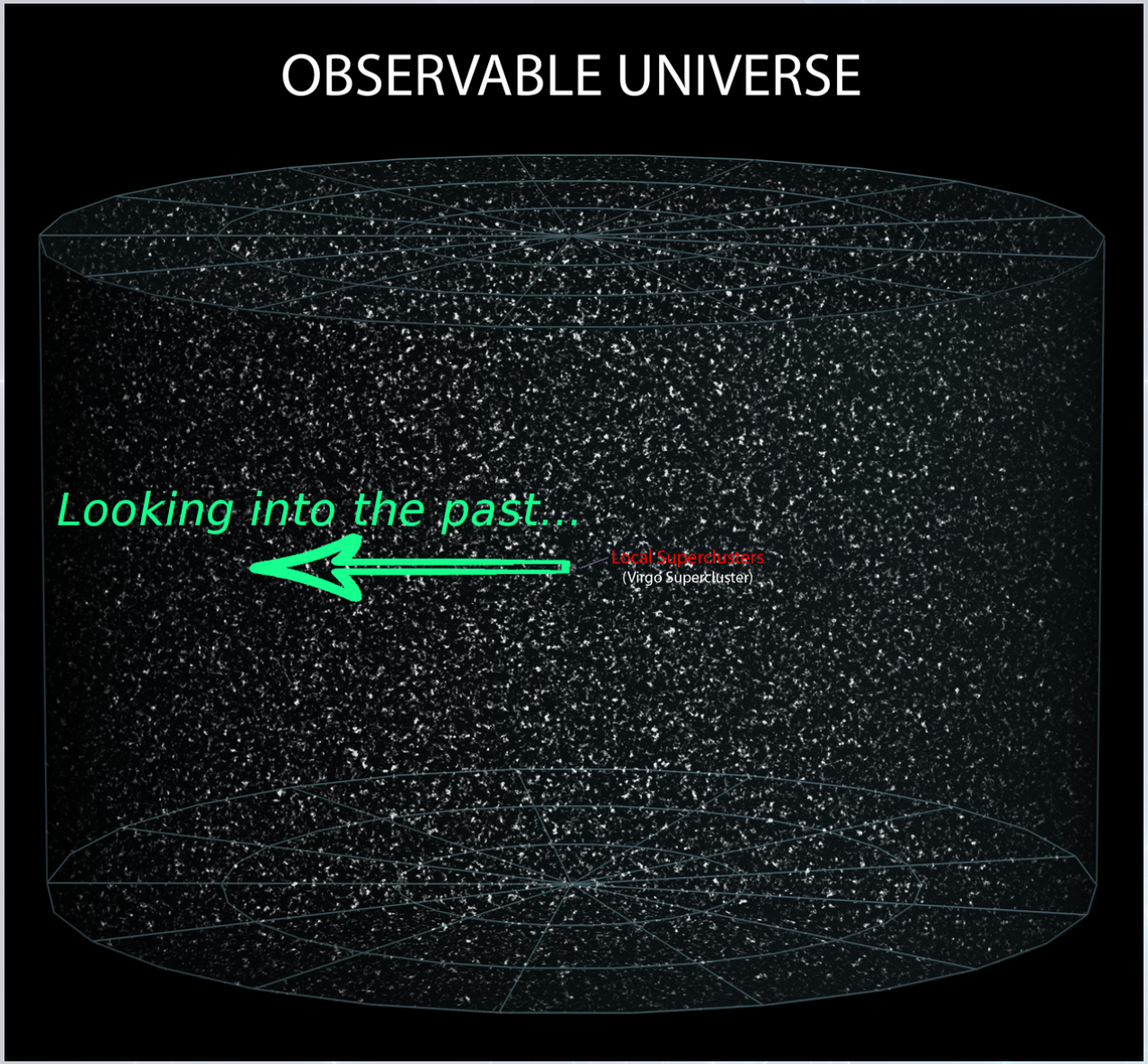

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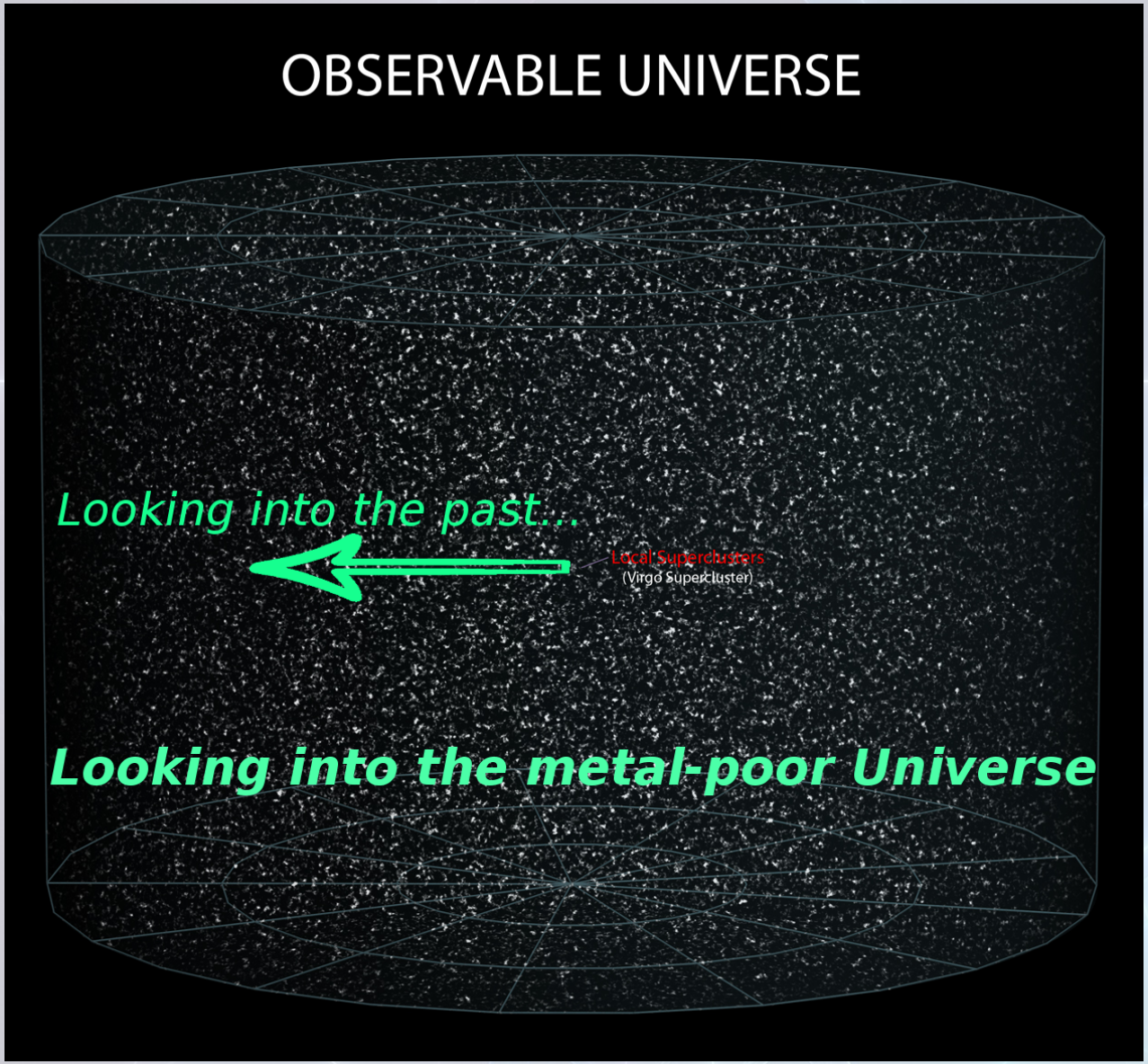

Metal-poor *massive* stars... theory

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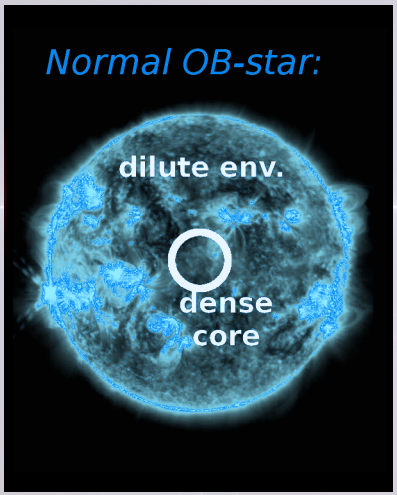
massive: > 8 times the Sun – rare but influential



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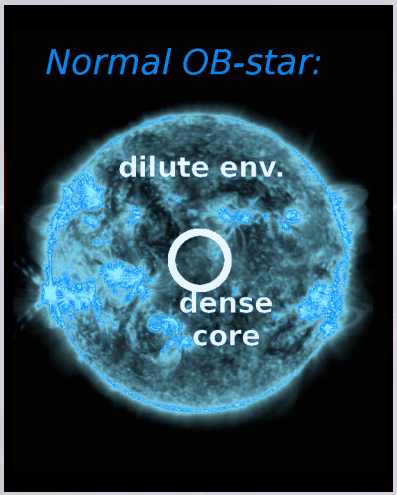
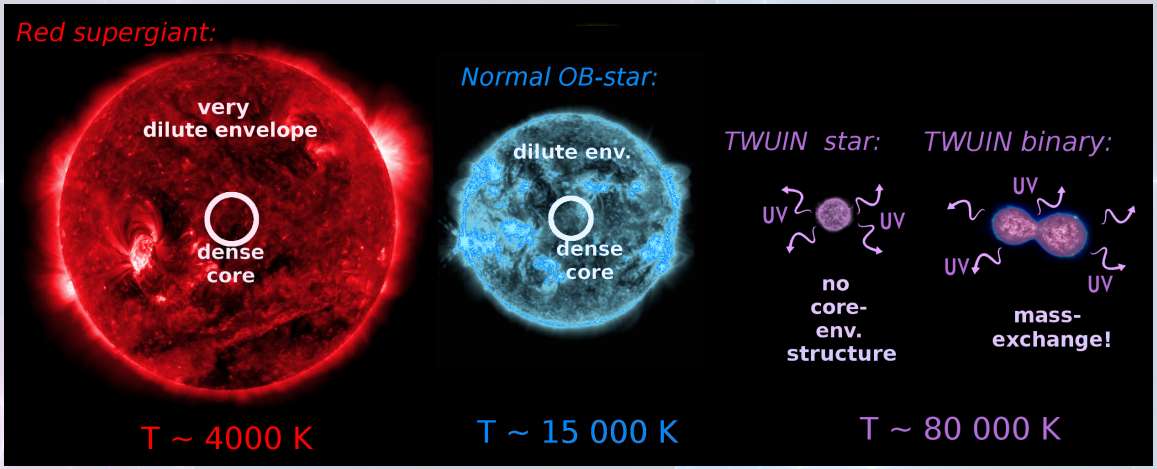


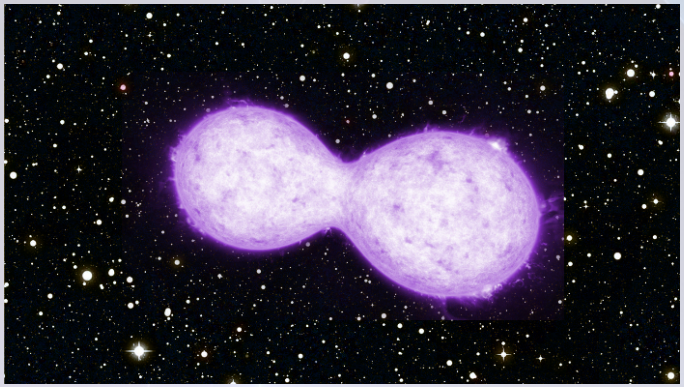
Metal-rich



Metal-poor: new stars predicted!

e.g. Szécsi+15, Szécsi+18, Szécsi+19

Gravitational waves... theoretical origin!



e.g. Szécsi'17a

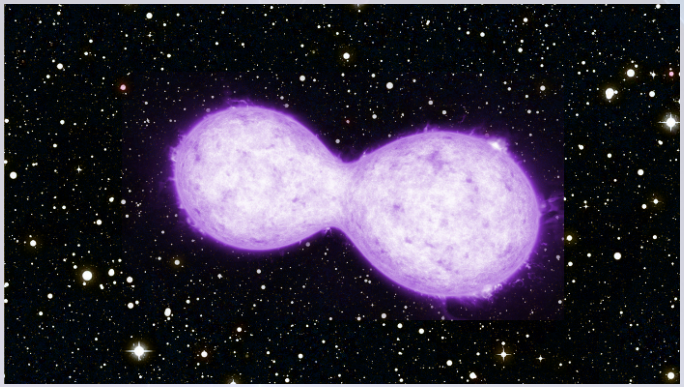
Szécsi'17b

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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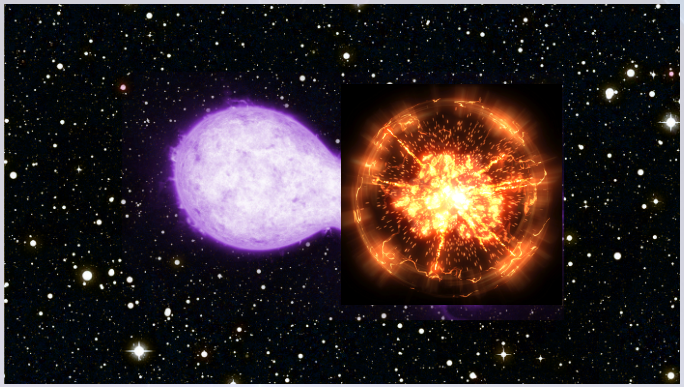
Life

Death



Massive binaries

Explosions

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Life

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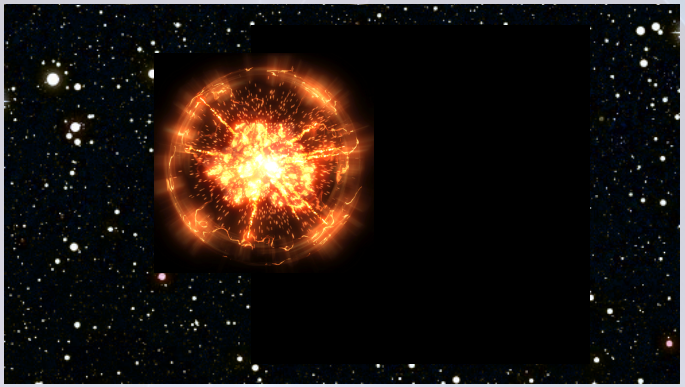

Massive binaries

Explosions

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Gravitational waves... theoretical origin!

Life

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Afterlife

Massive binaries

Explosions

2 Black Holes
(or Neutron Stars)

e.g. **Szécsi**'17a

Szécsi'17b

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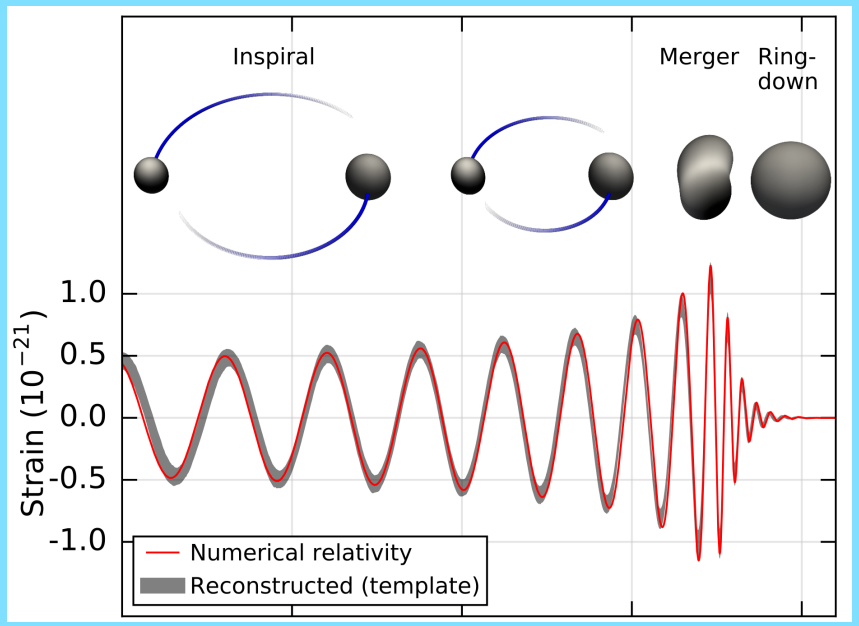
'Second death'



Credit: http://gallatin.physics.lsa.umich.edu

Merger

e.g. Szécsi'17a

Szécsi'17b

Bagoly,Szécsi+16

Marchant+16,17

Gravitational waves... theoretical origin!

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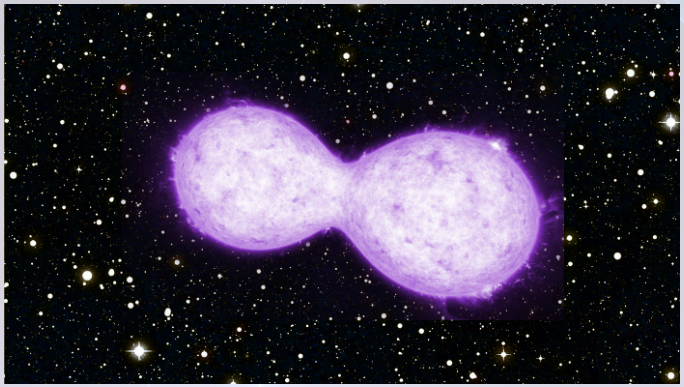

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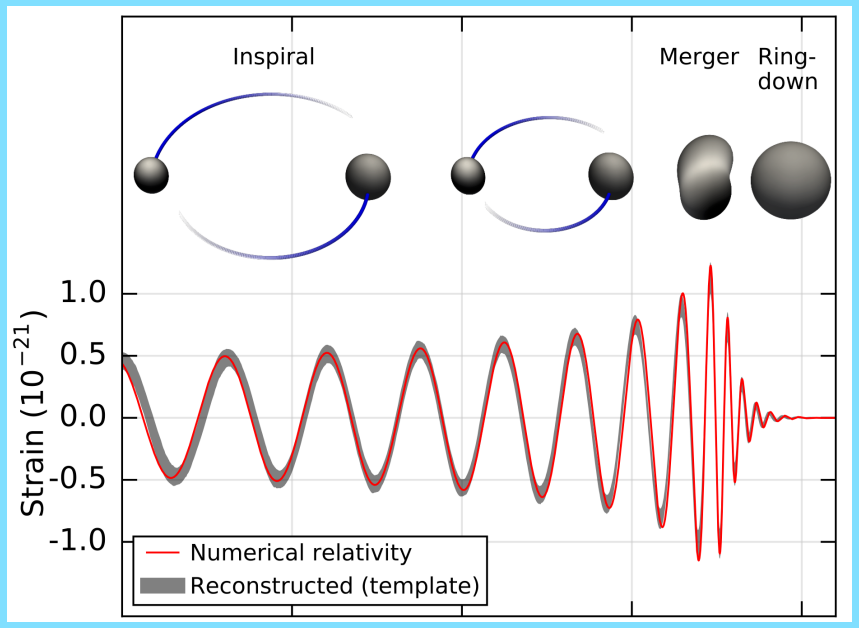

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However...

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

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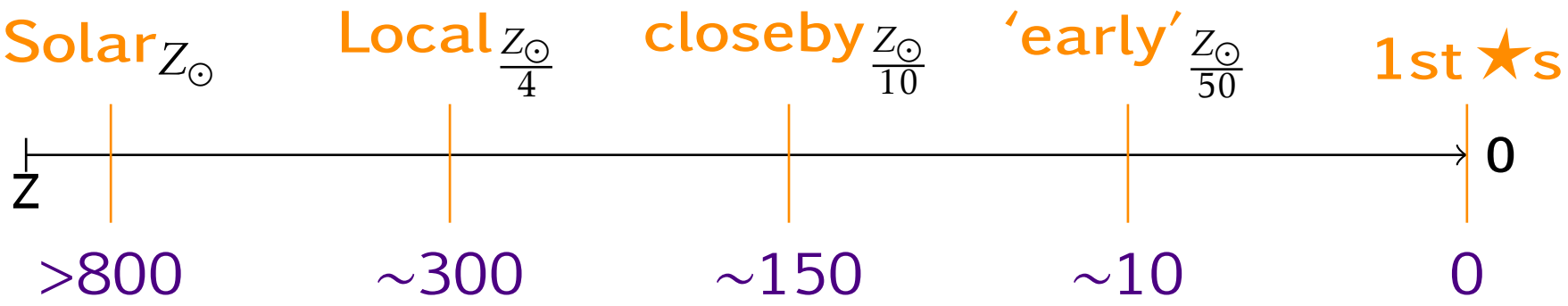
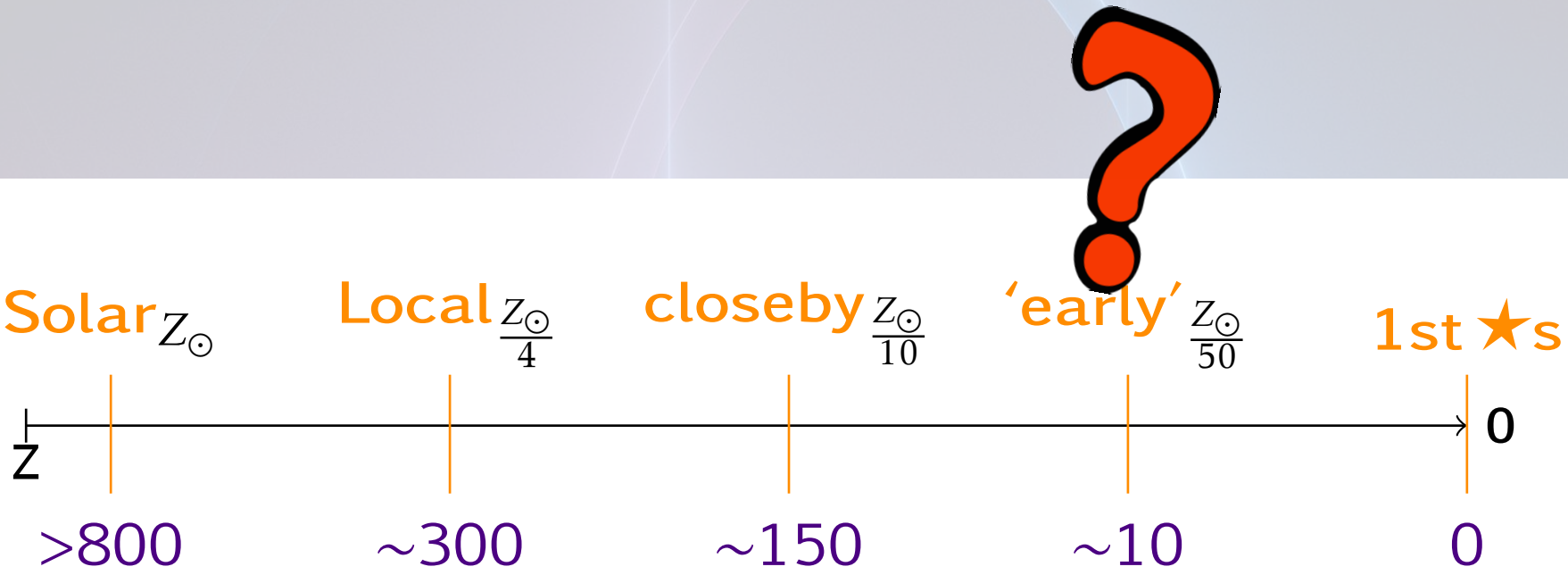


spectroscopy
(i.e. direct evidence)

e.g. Castro+14,+18, Ramírez-Agudelo+17, Kubátová&**Szécsi**+18

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



spectroscopy
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Gravitational wave theories...

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My research

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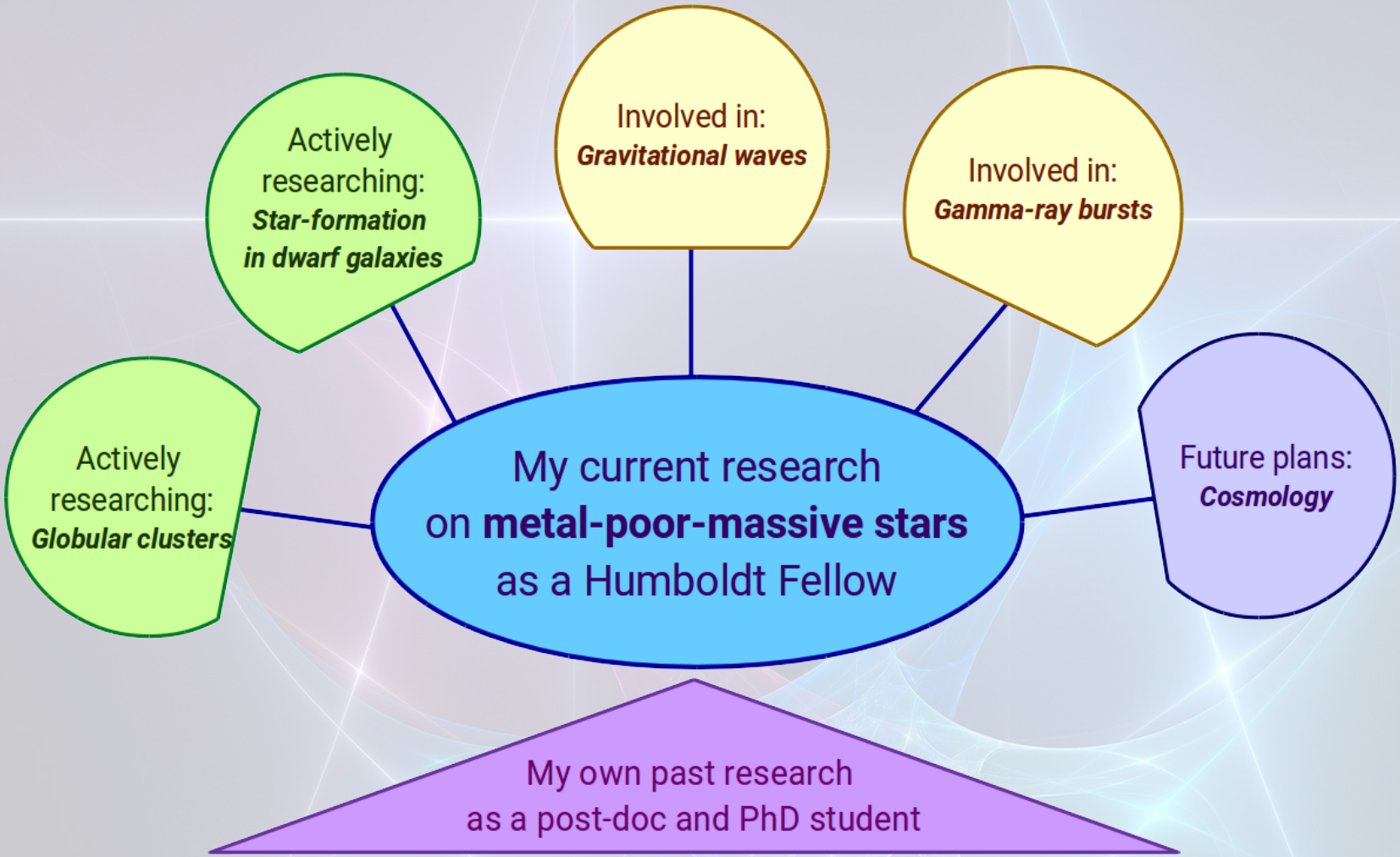
Dr. Dorottya Szécsi, NCU, Toruń