

Gravitational Wave Progenitors

solving the Cosmic Lithium Problem

Dorottya Szécsi

Assistant Professor & OPUS group leader
Nicolaus Copernicus University

UCL, 18th April 2023



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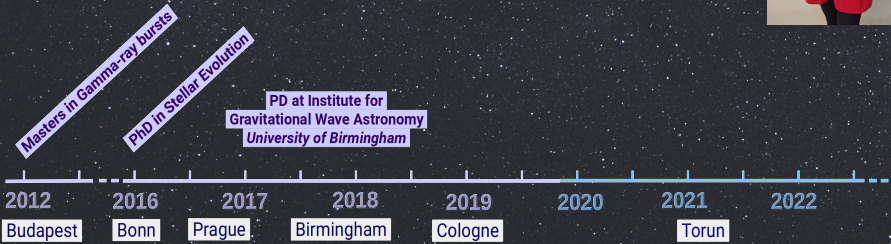
Masters in Gamma-ray bursts

PhD in Stellar Evolution



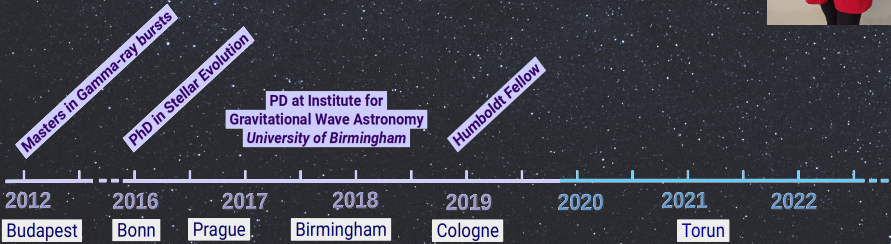
Dorottya Szécsi

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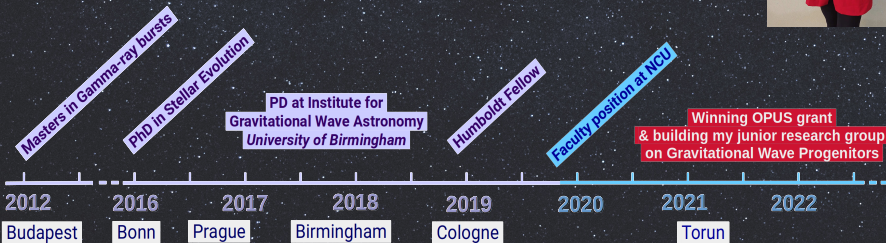
Assistant Prof. &
OPUS group leader



Dorottya Szécsi

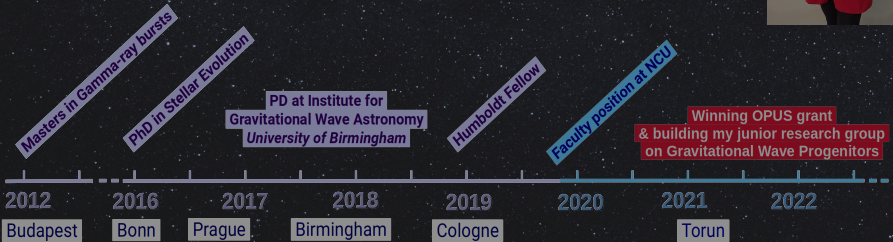
Assistant Prof. &

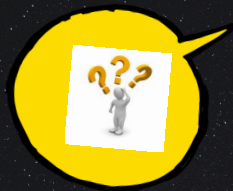
OPUS group leader



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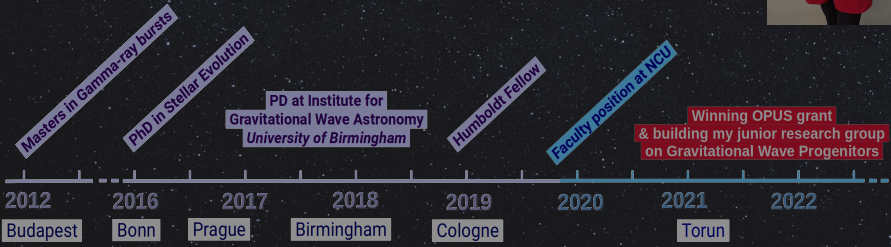
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OPUS group leader





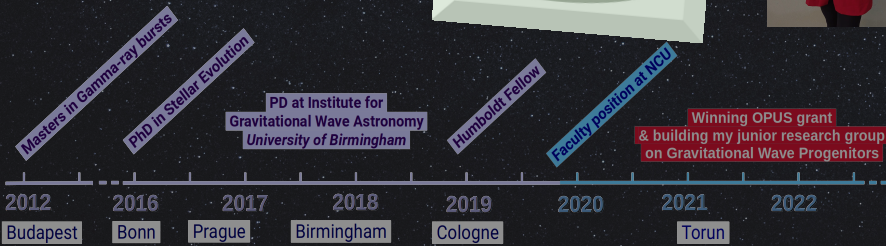
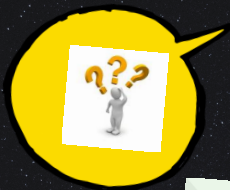
Dorottya Szécsi

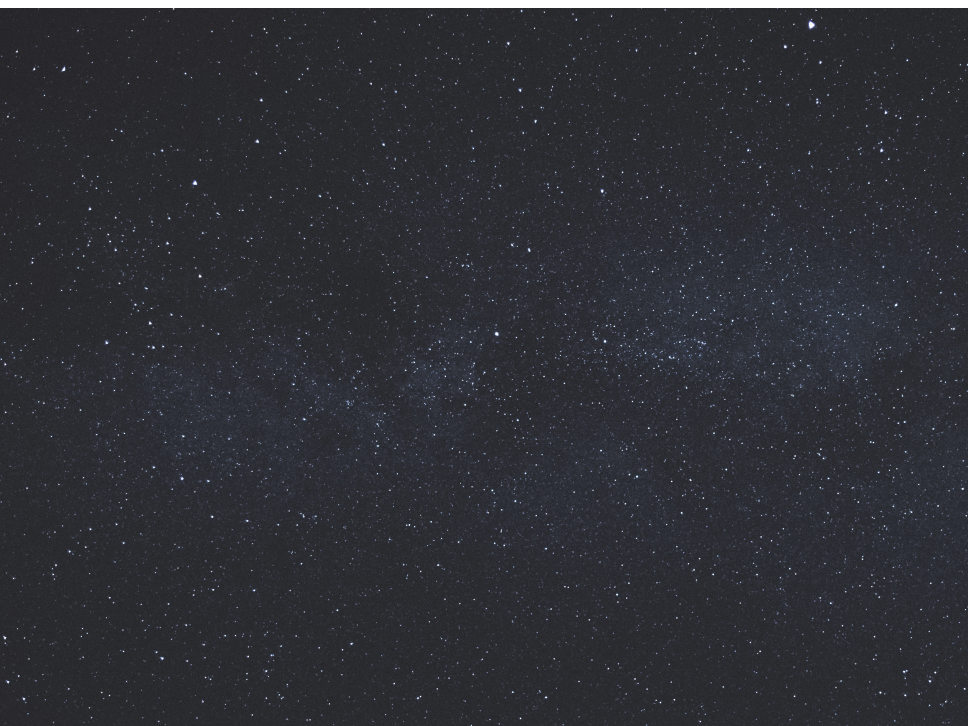
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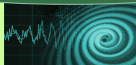




Dwarf galaxies



Gravitational waves



High-redshift Univ.



Gamma-ray bursts



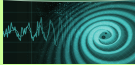
Globular clusters



Dwarf galaxies



Gravitational waves



High-redshift Univ.



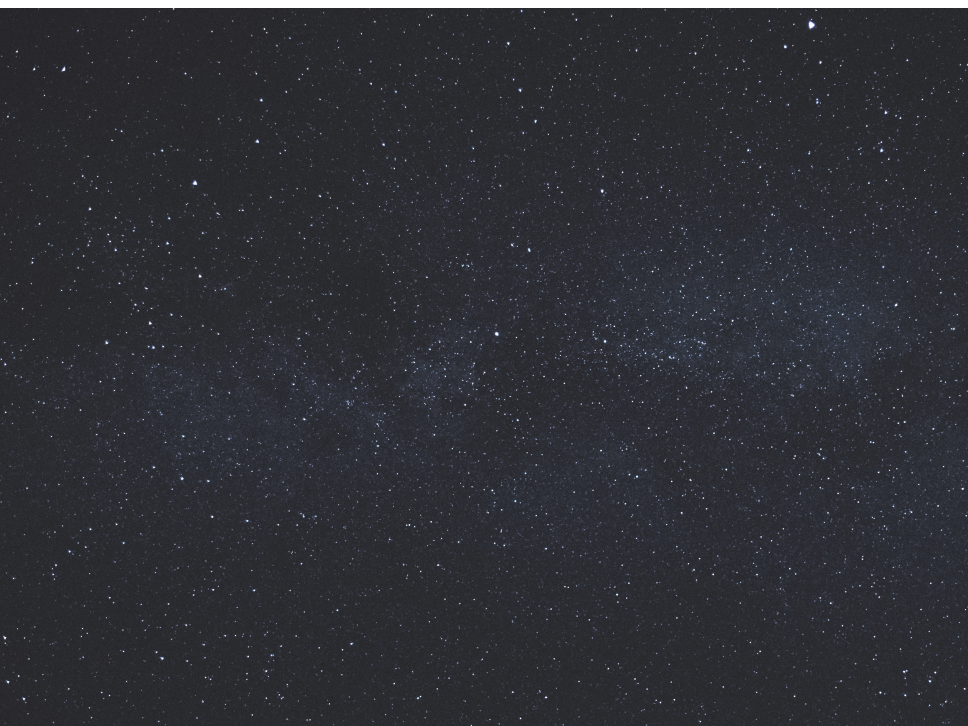
Metal-poor
massive stars

Gamma-ray bursts



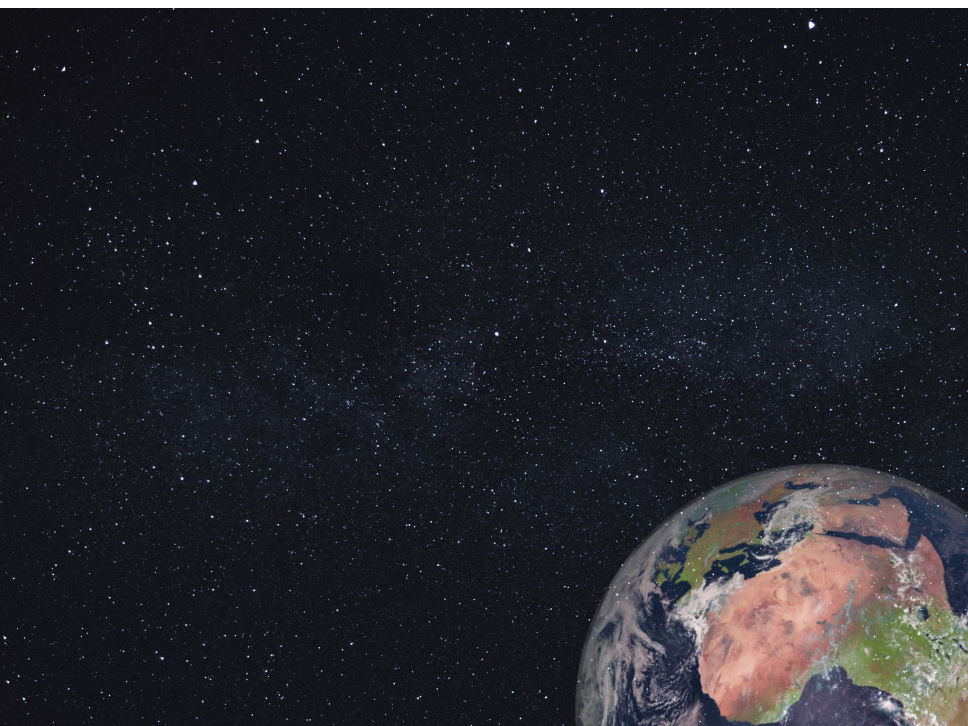
Globular clusters

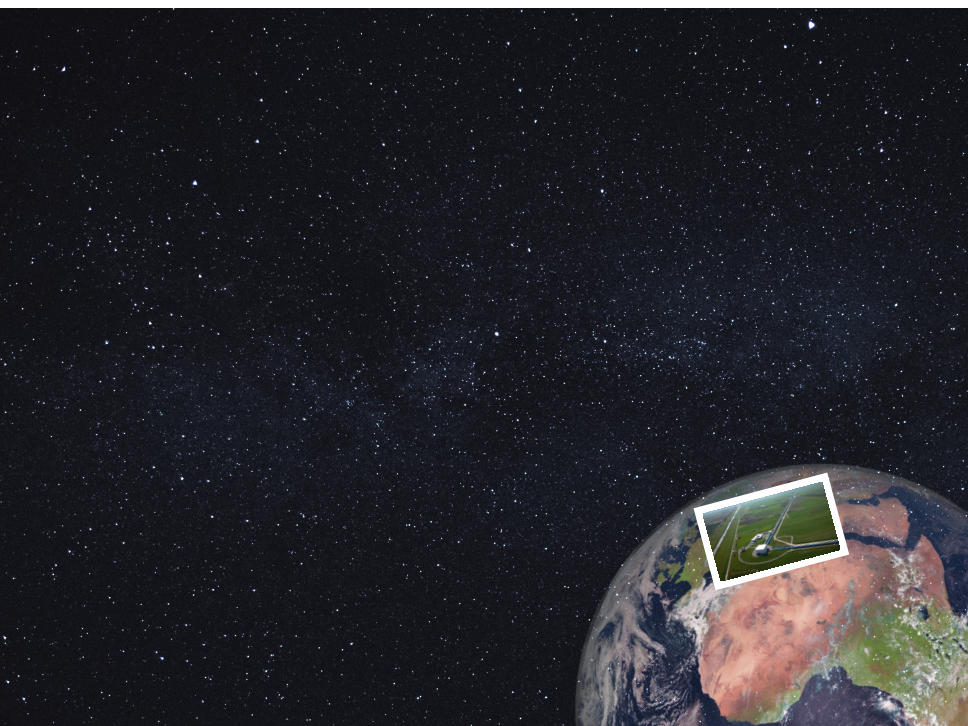


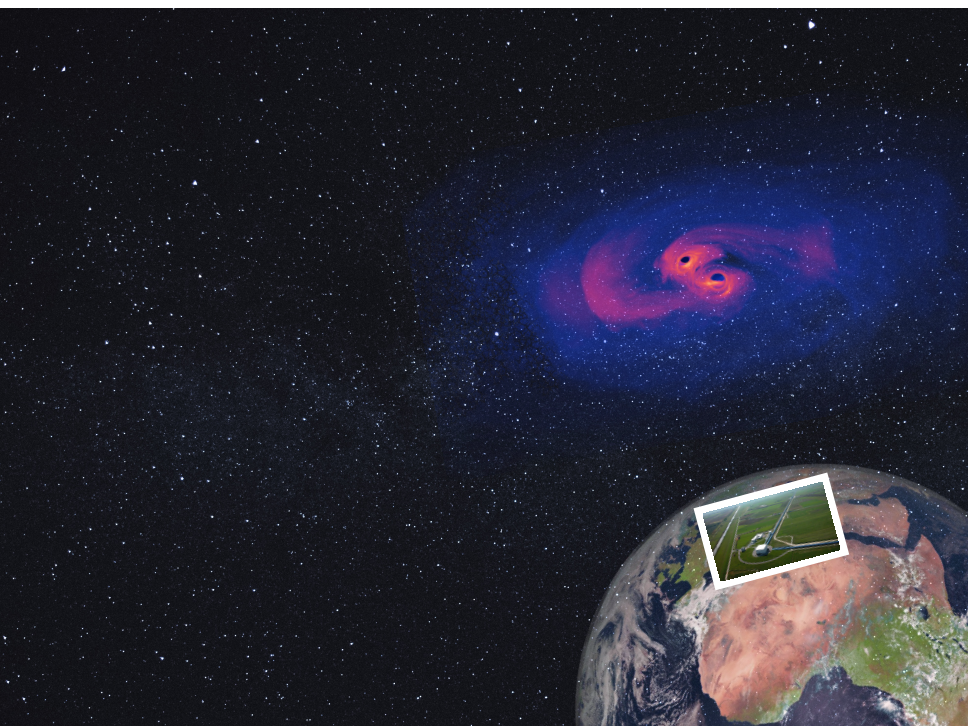


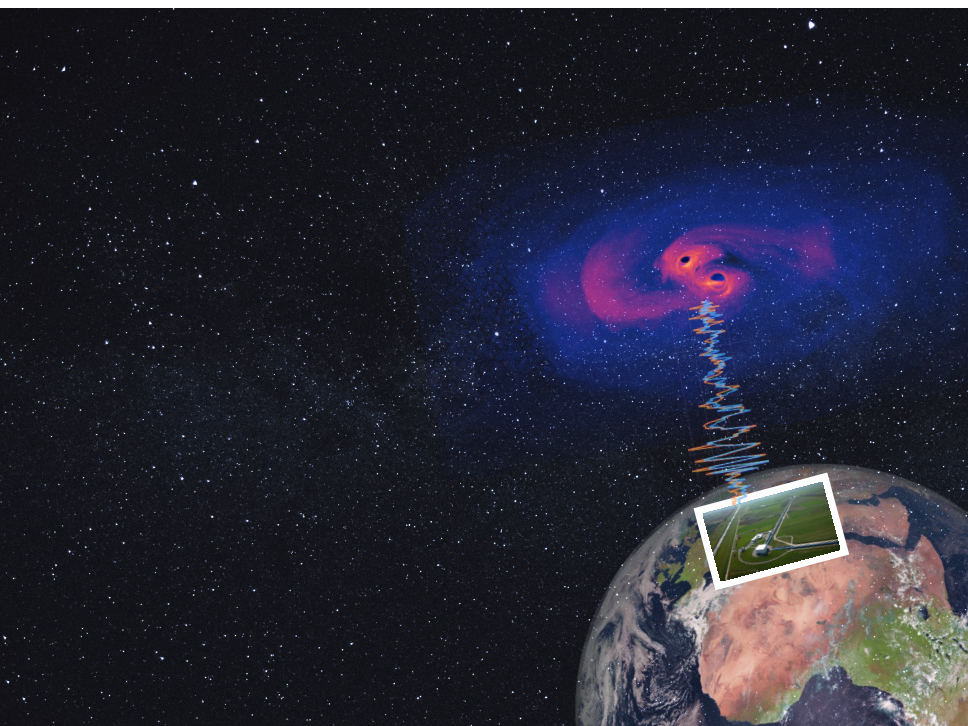
Why?

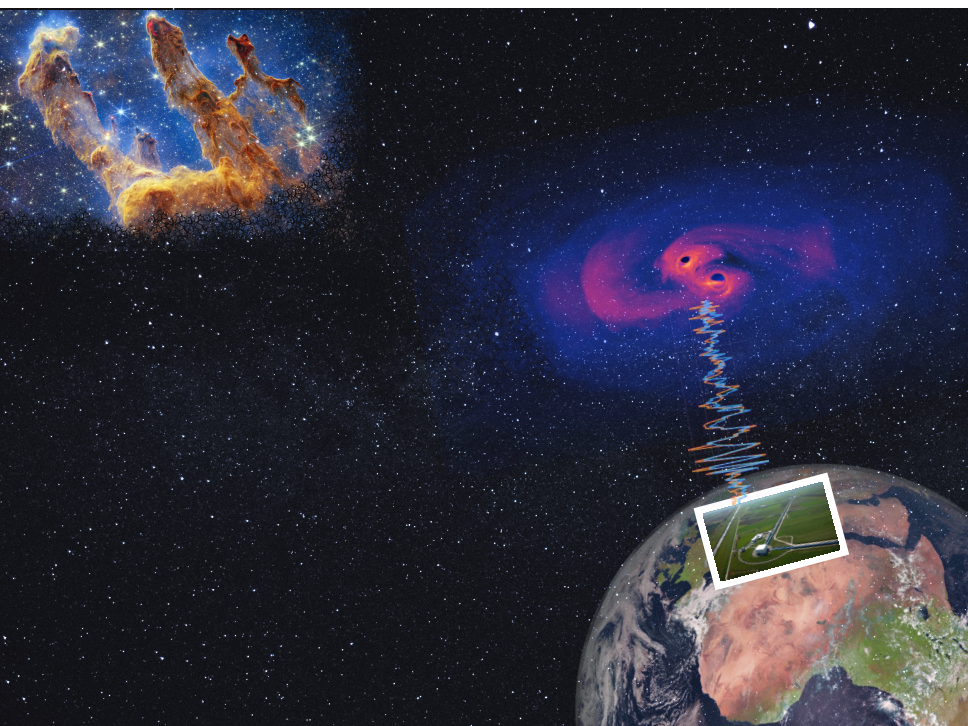
Where do Gravitational Waves come from?

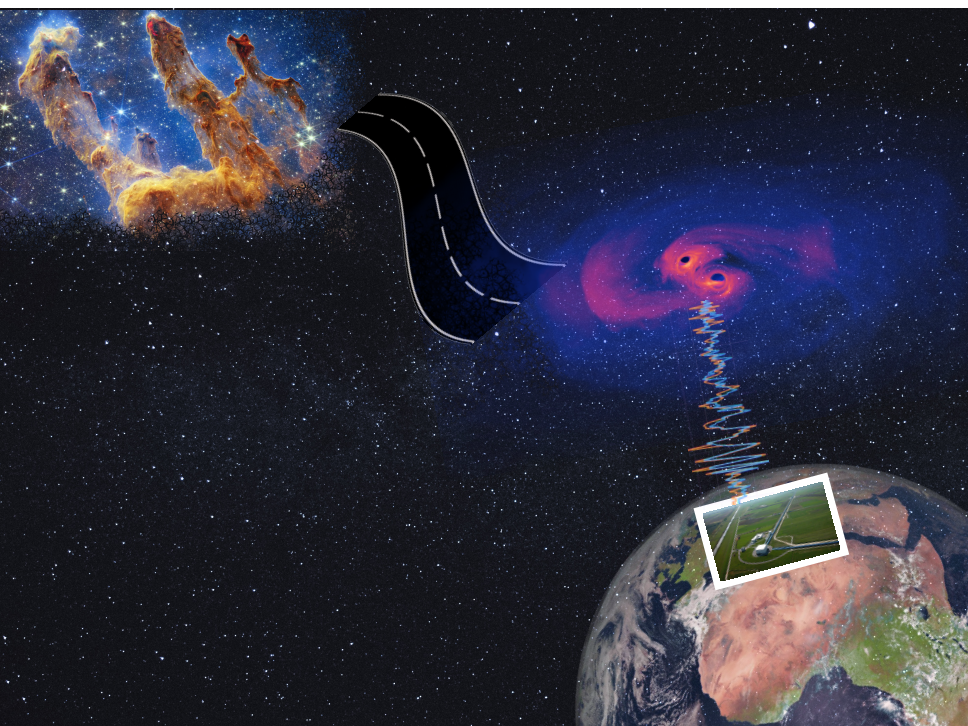


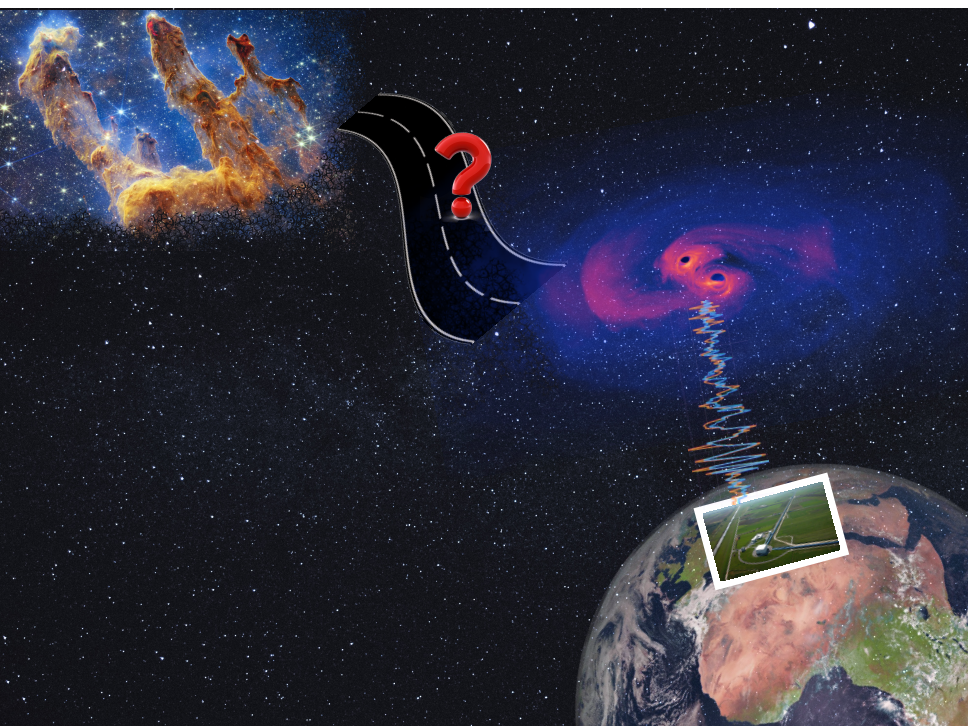












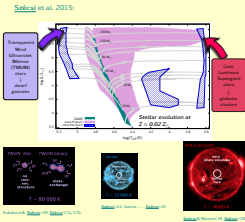
Metal-poor massive stars

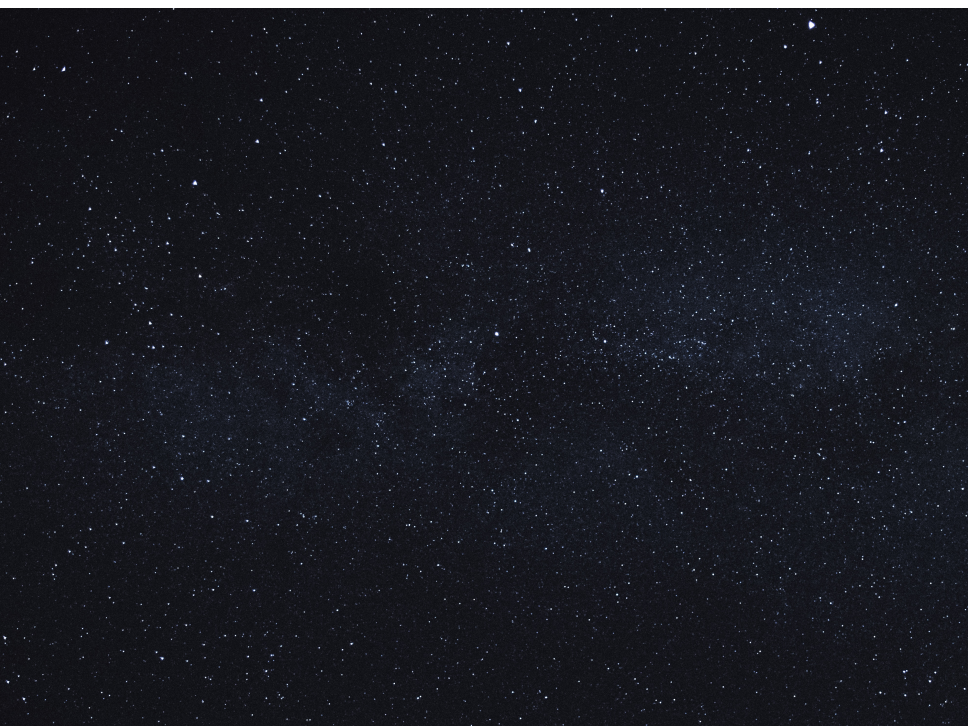
Metal-poor because...

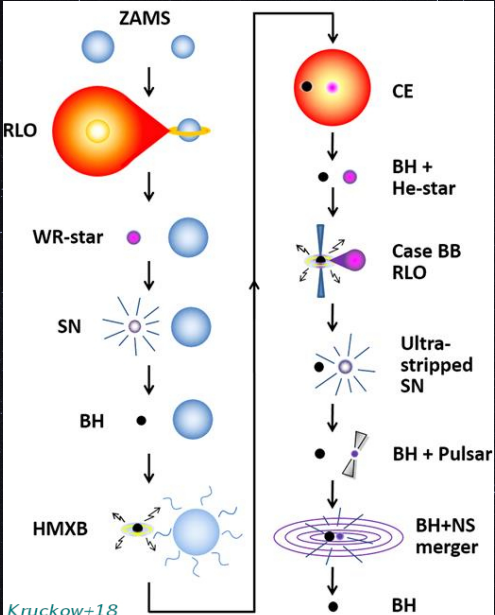
- early epochs of the Universe
- average metallicity: between $0-Z_{\odot}$

Massive stars because...

- 'massive' by def.: $>8 M_{\odot}$
- BHs of aLIGO/Virgo: 20–80 M_{\odot}

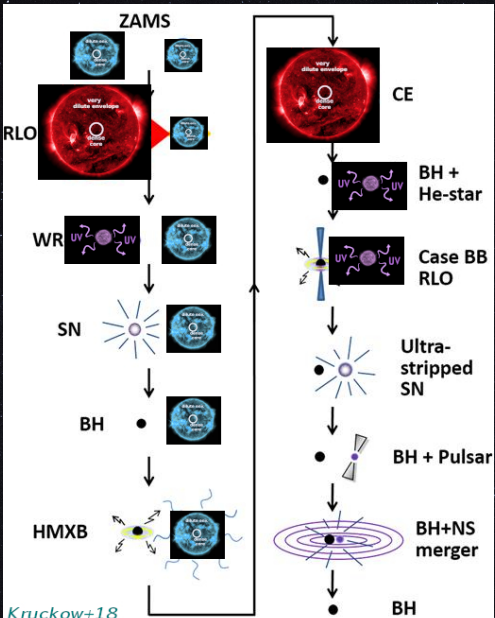




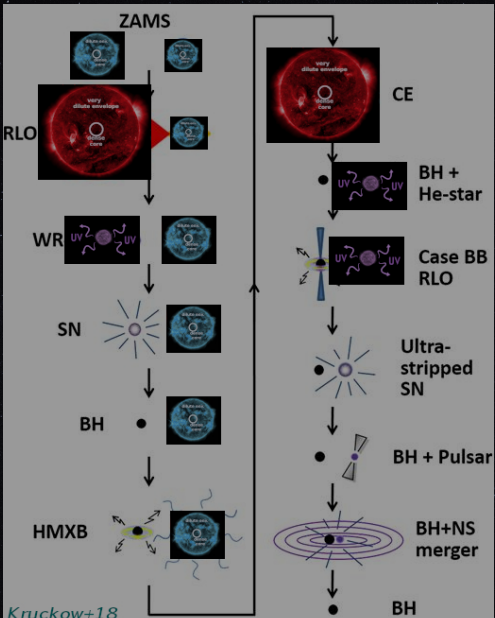


Kruckow+18
 based on the models of *Szécsi+15*

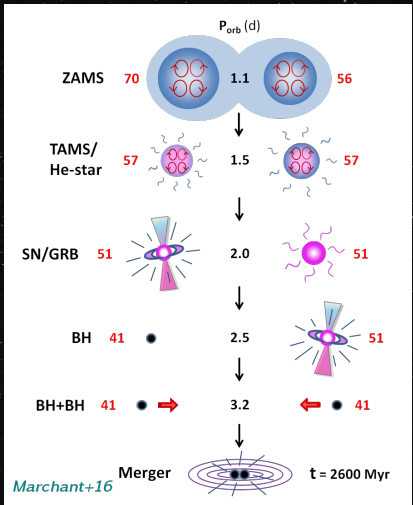




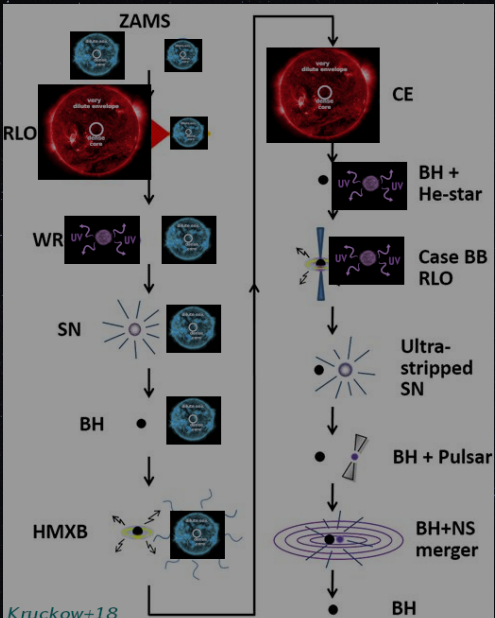
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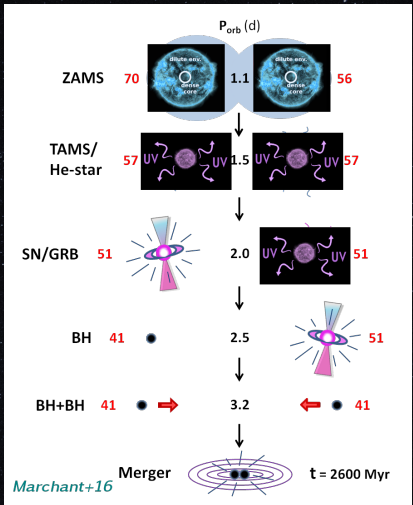
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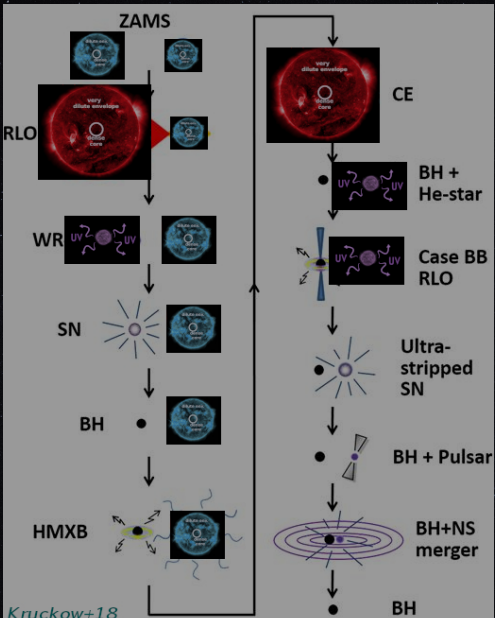


Marchant+16

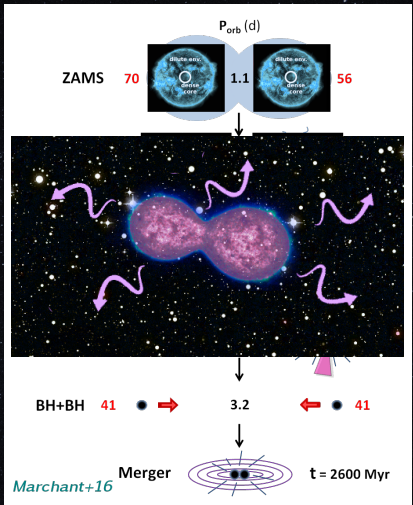


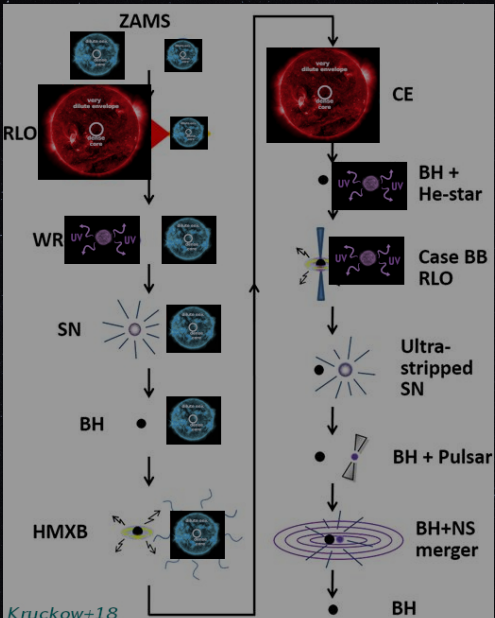
Kruckow+18
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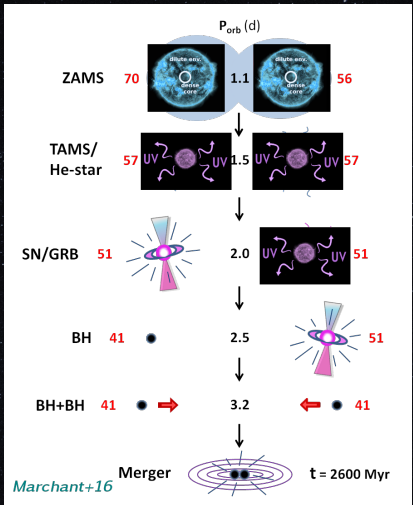


Kruckow+18
 based on the models of *Szécsi+15*





Kruckow+18
 based on the models of *Szécsi+15*



Marchant+16

Financed
for 4 years
(OPUS)

My people

At the NCU:



Dr. Poojan Agrawal
*(now post-doc
at Carnegie, USA)*



Hanno Stinshoff
(PhD student)

Rafia Sarwar
(PhD student)



Dr. Koushik Sen
(post-doc)



Dr. Áron Szabó
(PD fellow)



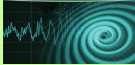
Future plans:

*solving the Cosmic Lithium Problem
with GW progenitors*

Dwarf galaxies



Gravitational waves



High-redshift Univ.



Metal-poor
massive stars

Gamma-ray bursts



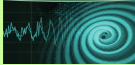
Globular clusters



Dwarf galaxies



Gravitational waves



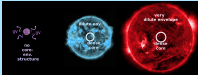
High-redshift Univ.



Gamma-ray bursts



Globular clusters



Szécsi+15a

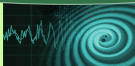
Kubátová & Szécsi+19

Szécsi+22

Dwarf galaxies



Gravitational waves



High-redshift Univ.



Metal-poor massive stars investigations

- massive stars significant γ -production
- most have had their mass lost
- especially in binaries \rightarrow OIF progressed

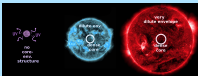


Vigna-Gomez..Szécsi+18

Stevenson..Szécsi+19

Agrawal..Szécsi+20

Romagnolo..Szécsi+23



Gamma-ray bursts



Globular clusters



Szécsi+13

Szécsi+15b

Szécsi'17a,b

ongoing PhD project (R. Sarwar)

Szécsi+18

Szécsi & Wünsch'19

ongoing PhD project (H. Stinshoff)