The first, and second, and third...

massive stellar generations in the early Universe

Dorottya Szécsi

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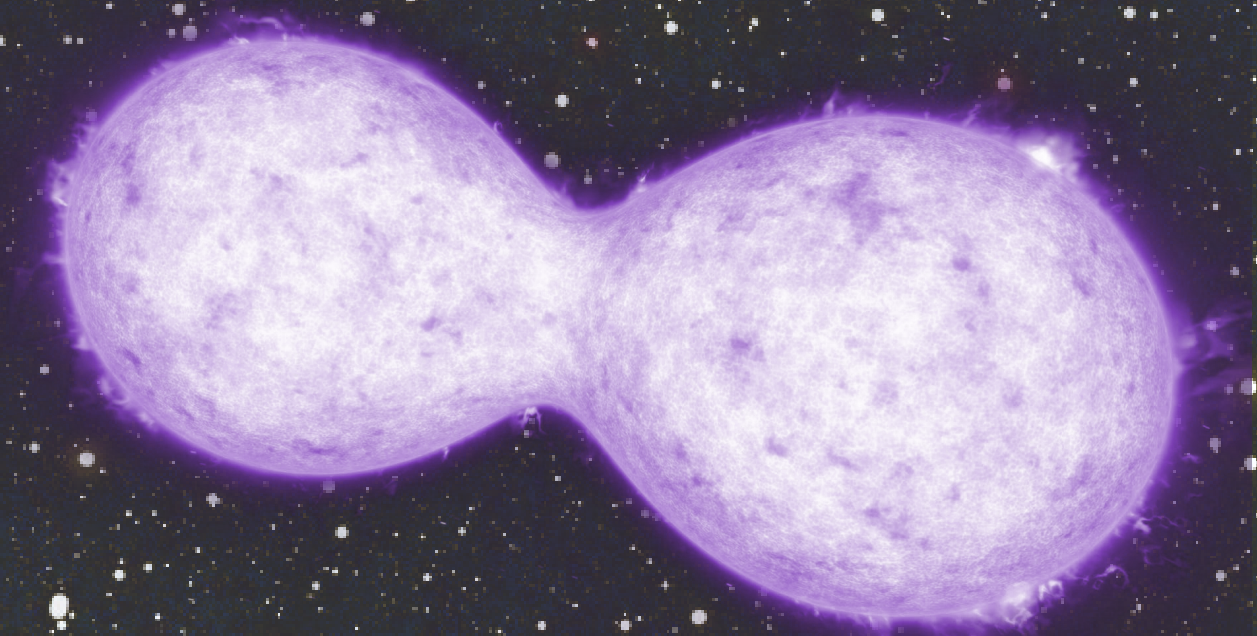
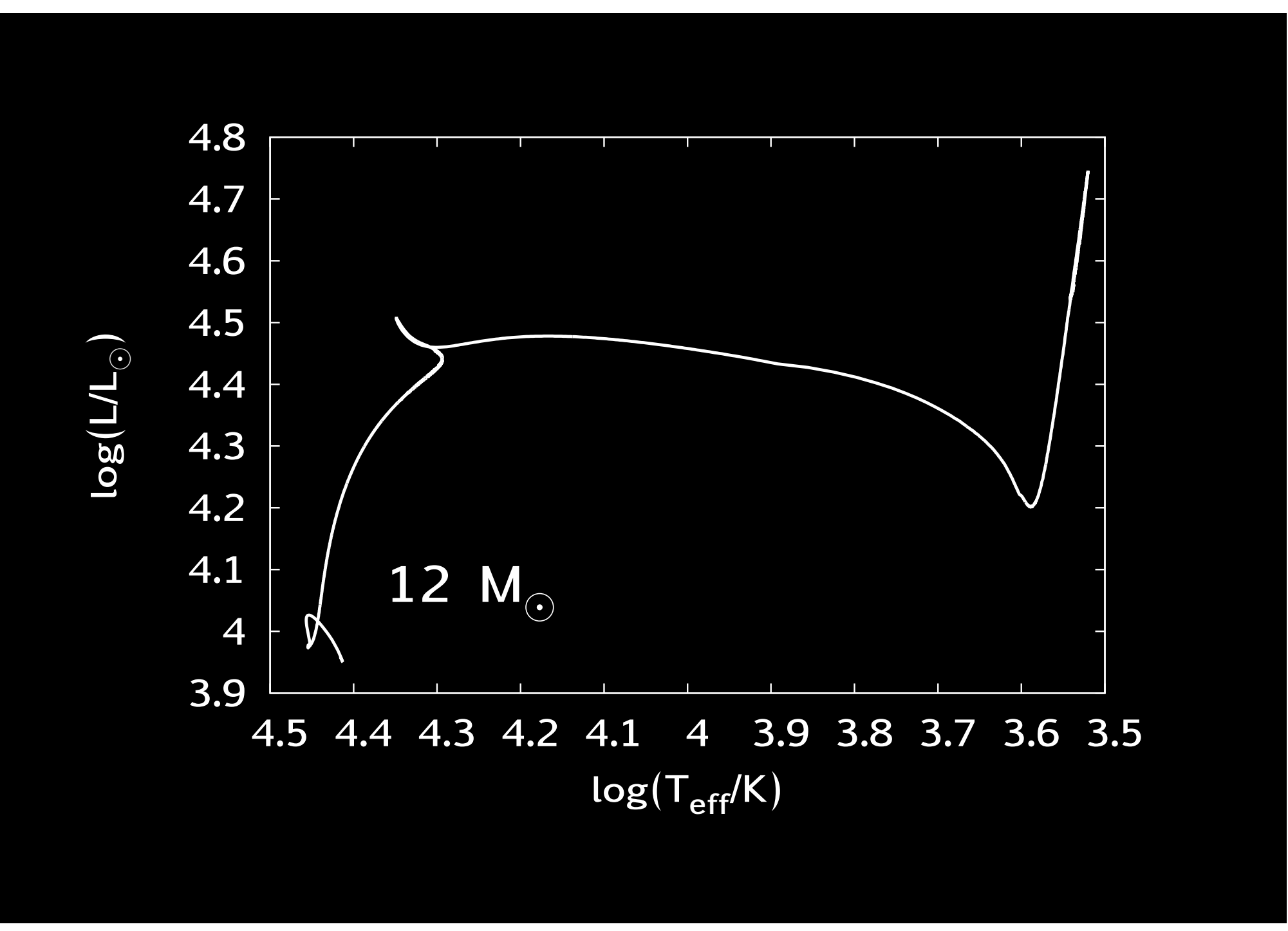
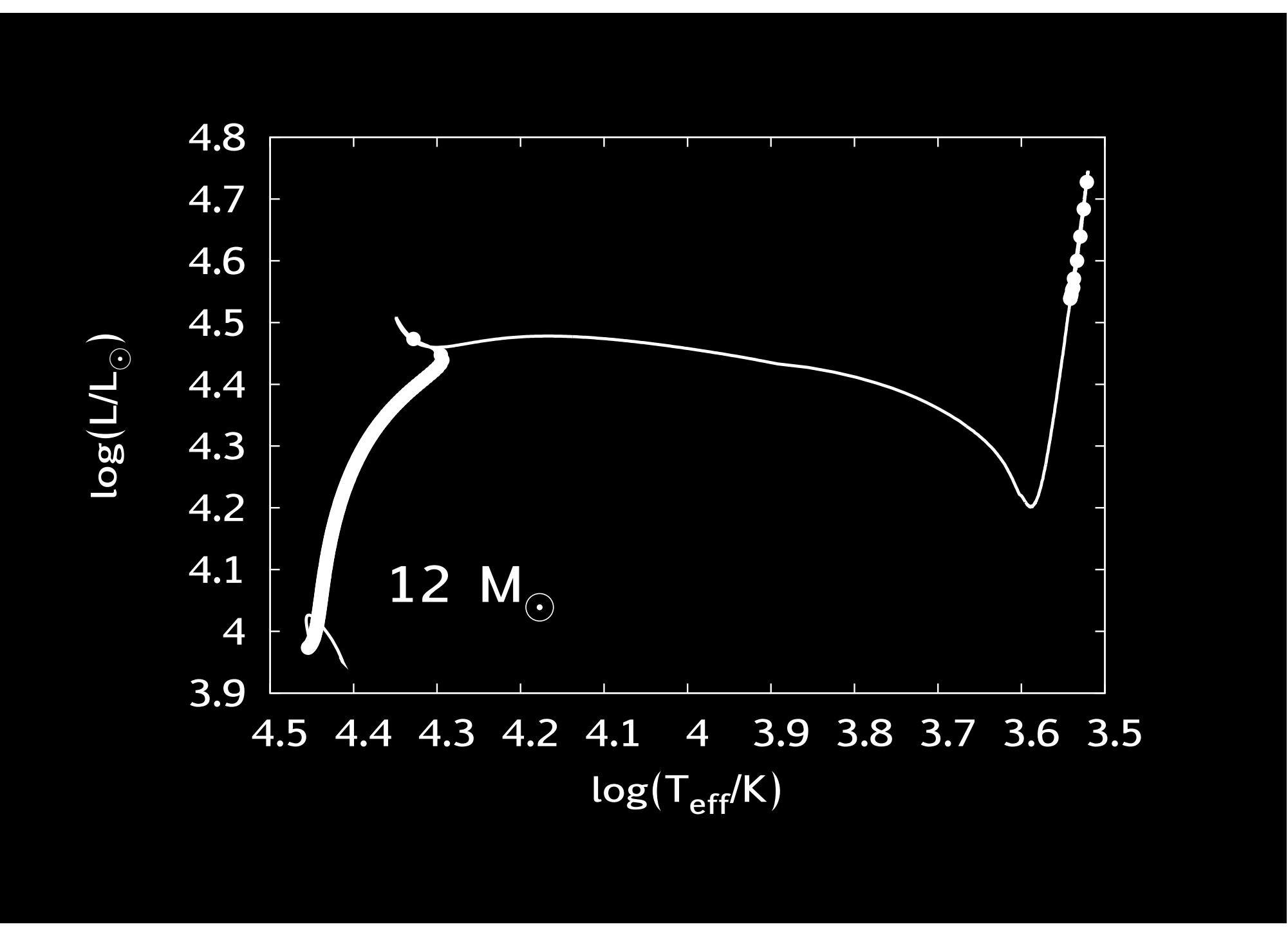
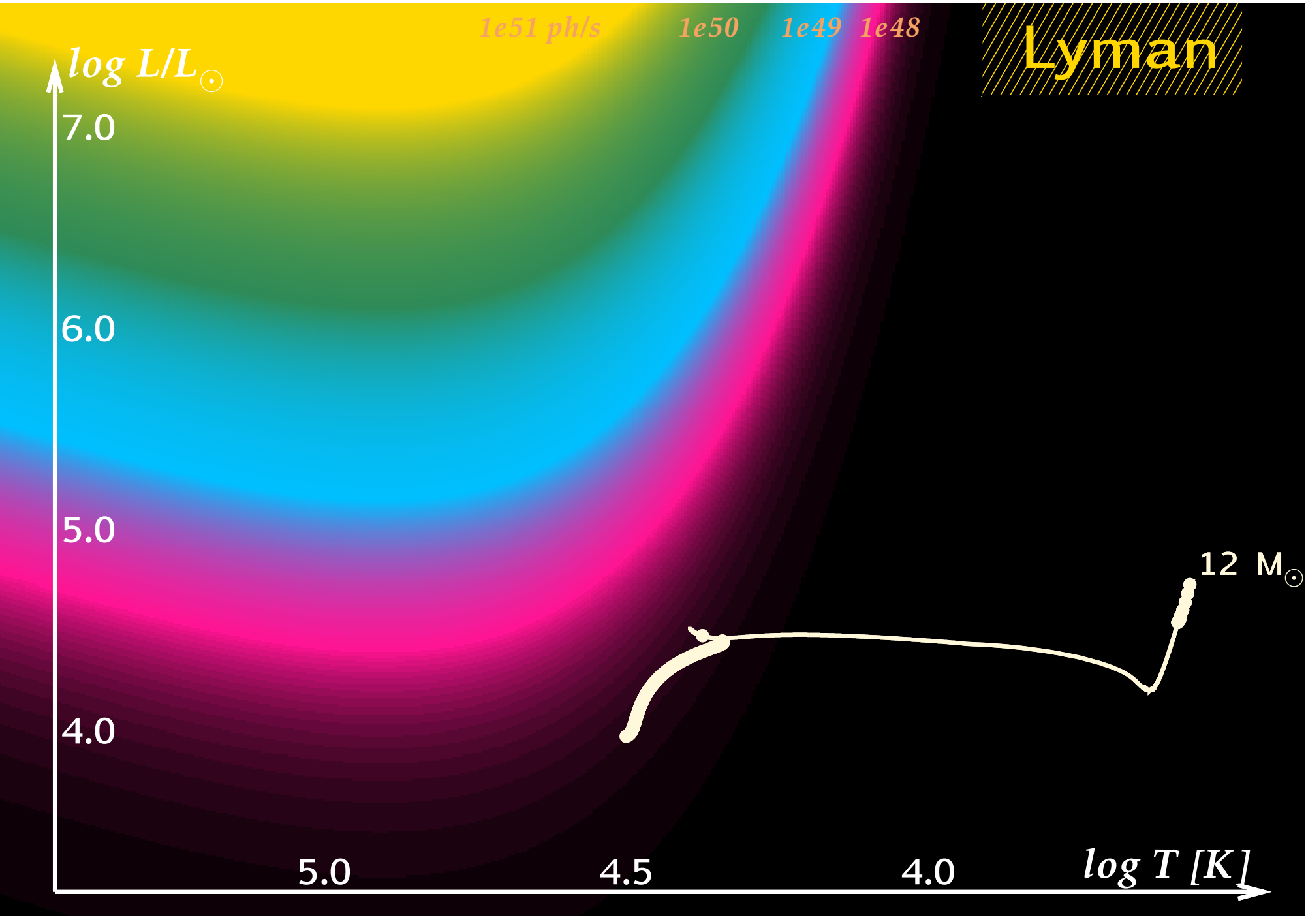
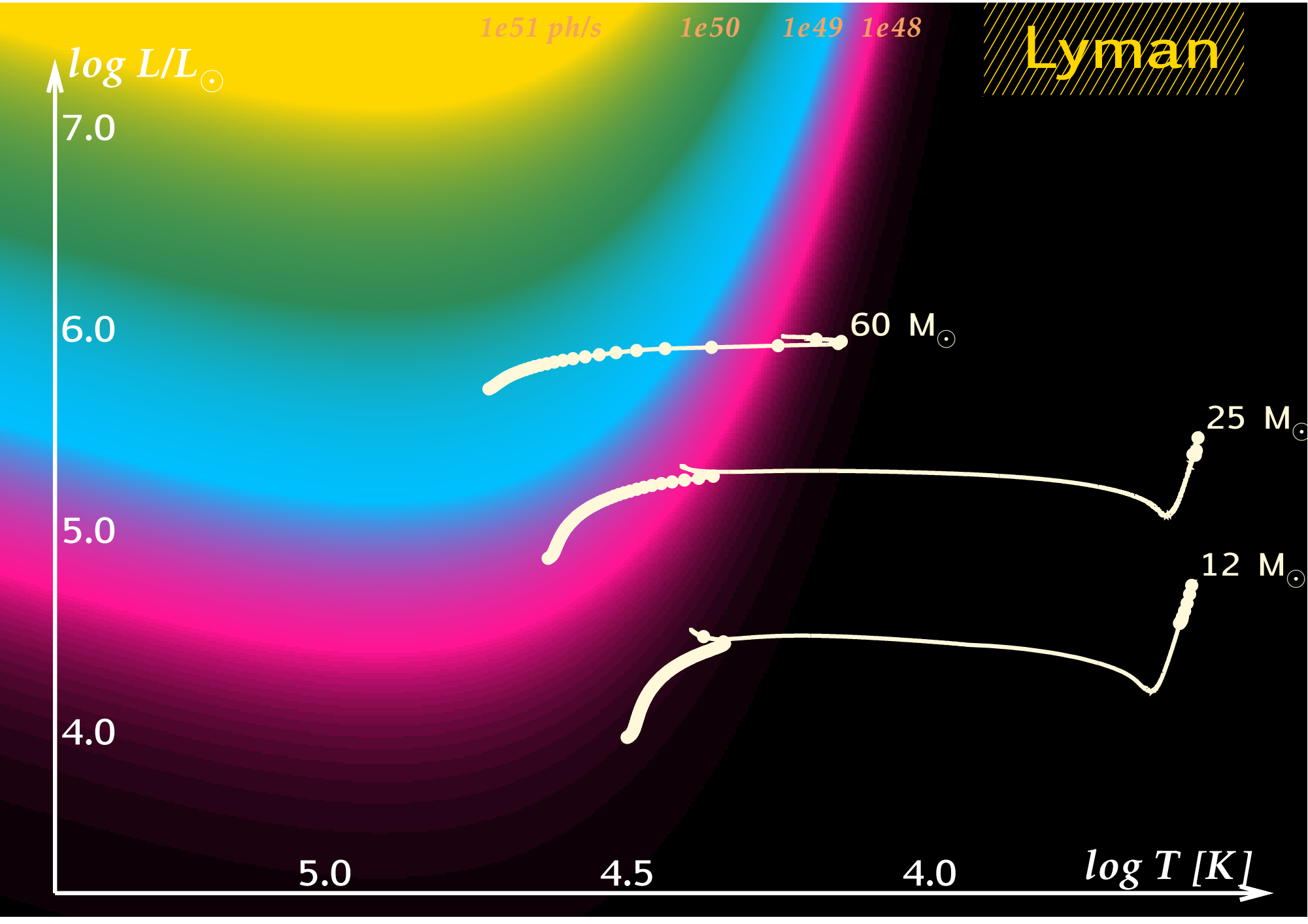
University of Birmingham, UK

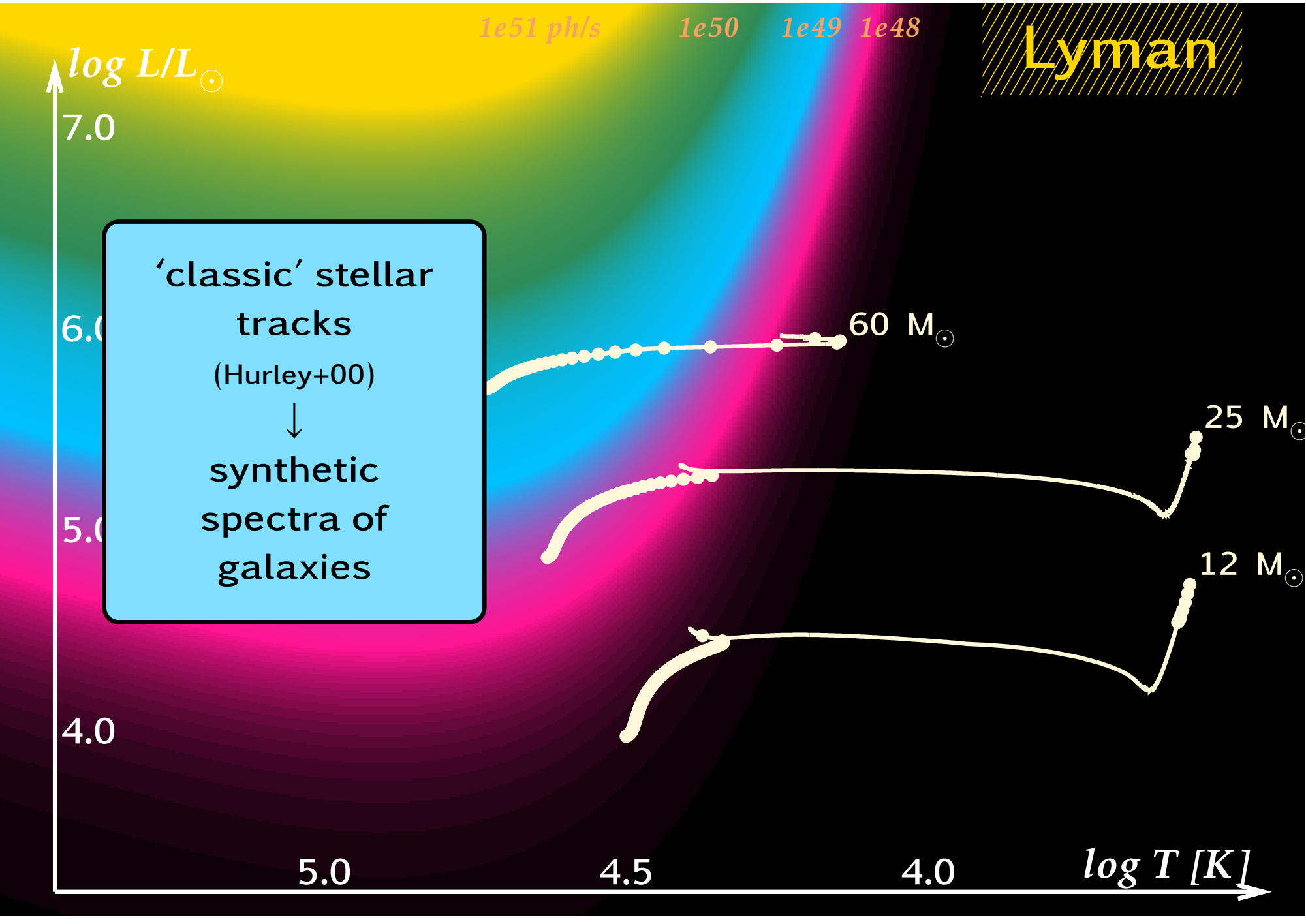


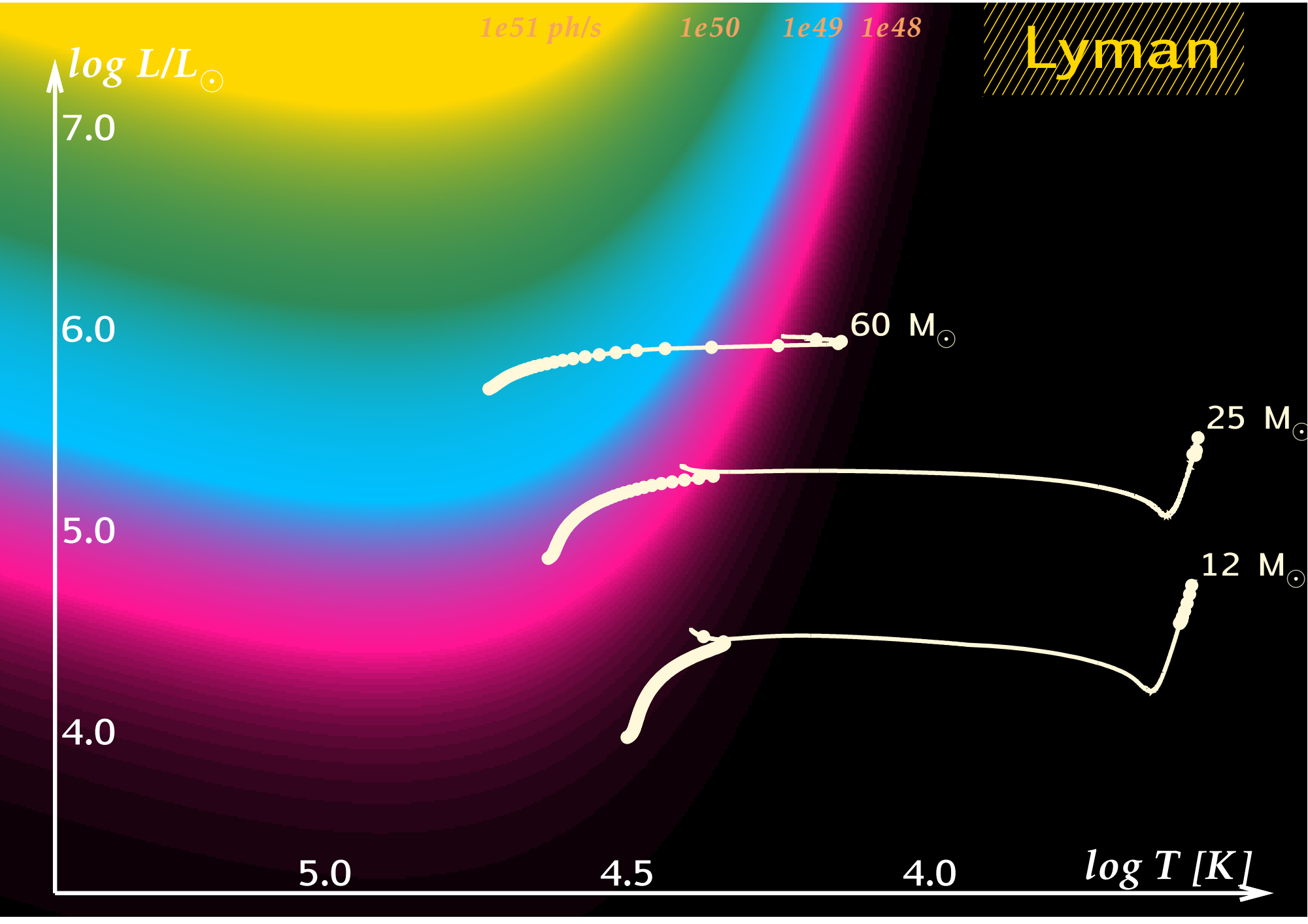

4.8
4.7
4.6
4.5
4.4
4.3
4.2
4.1
4
3.9
log(L/L⊙)
12 M⊙
4.5 4.4 4.3 4.2 4.1 4 3.9 3.8 3.7 3.6 3.5
log(Teff/K)

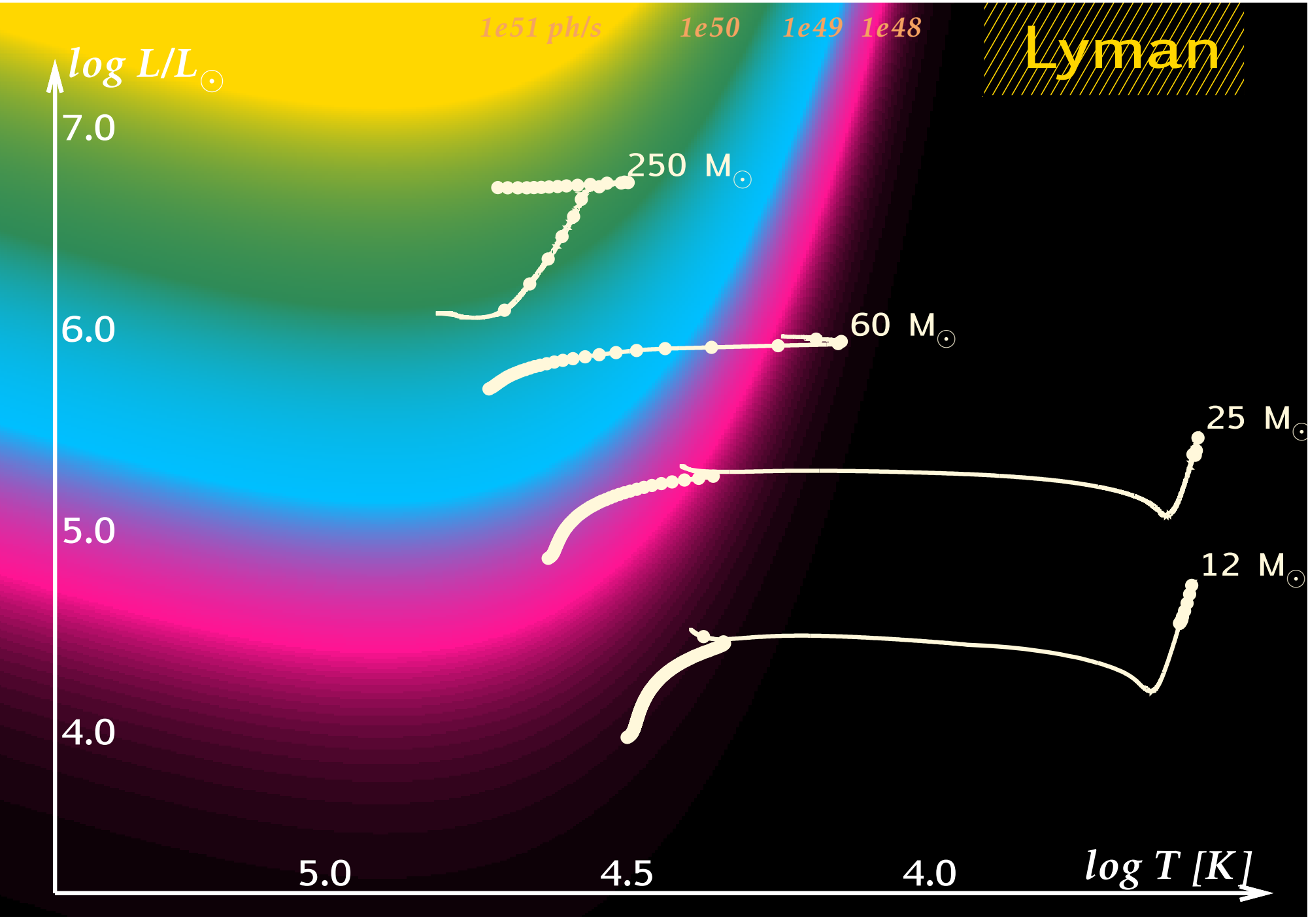

4.8
4.7
4.6
4.5
4.4
4.3
4.2
4.1
4
3.9
log(L/L⊙)
12 M⊙
4.5 4.4 4.3 4.2 4.1 4 3.9 3.8 3.7 3.6 3.5
log(Teff/K)

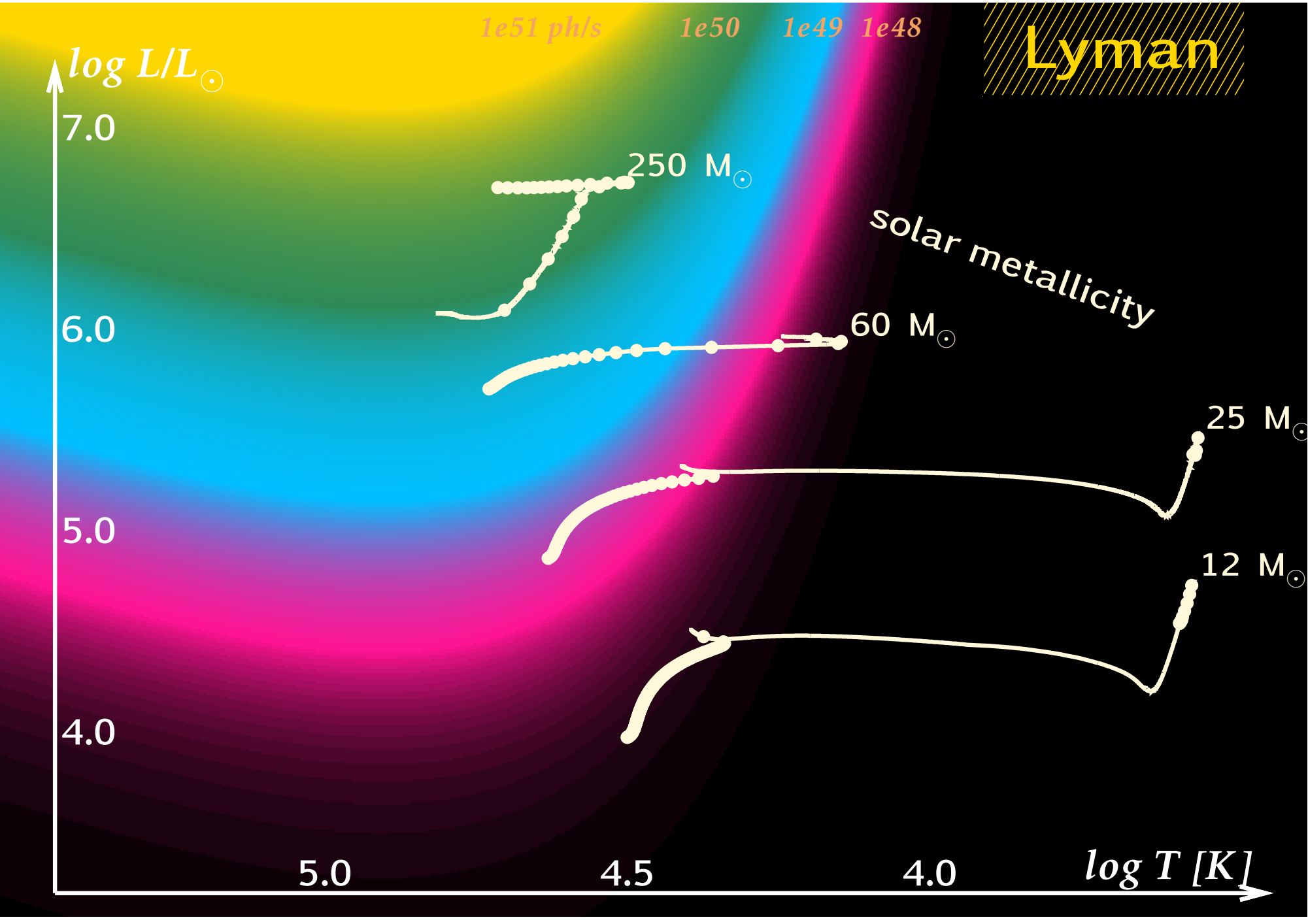

1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
12 M⊙
5.0
4.5
4.0
log T [K]

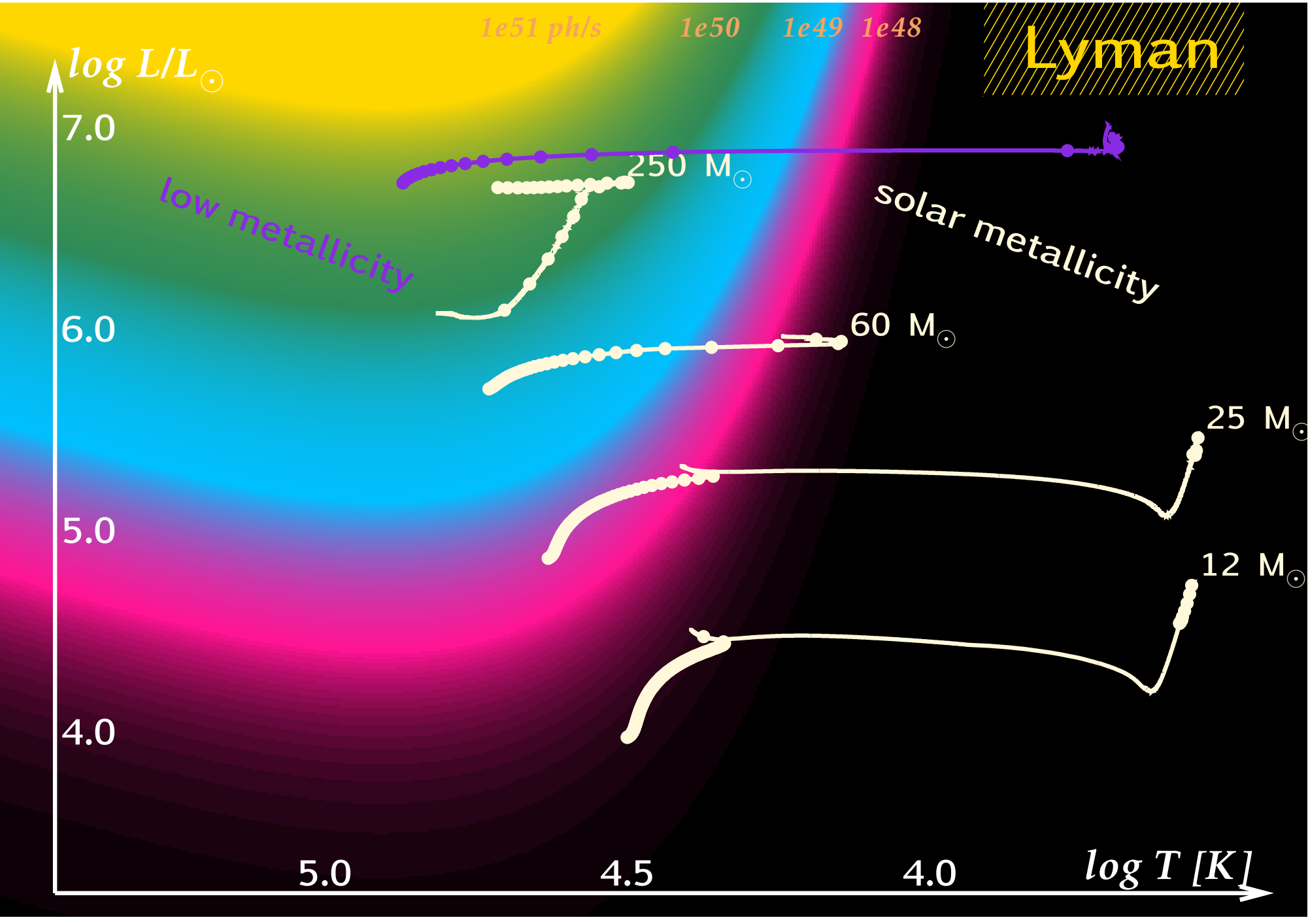

1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]

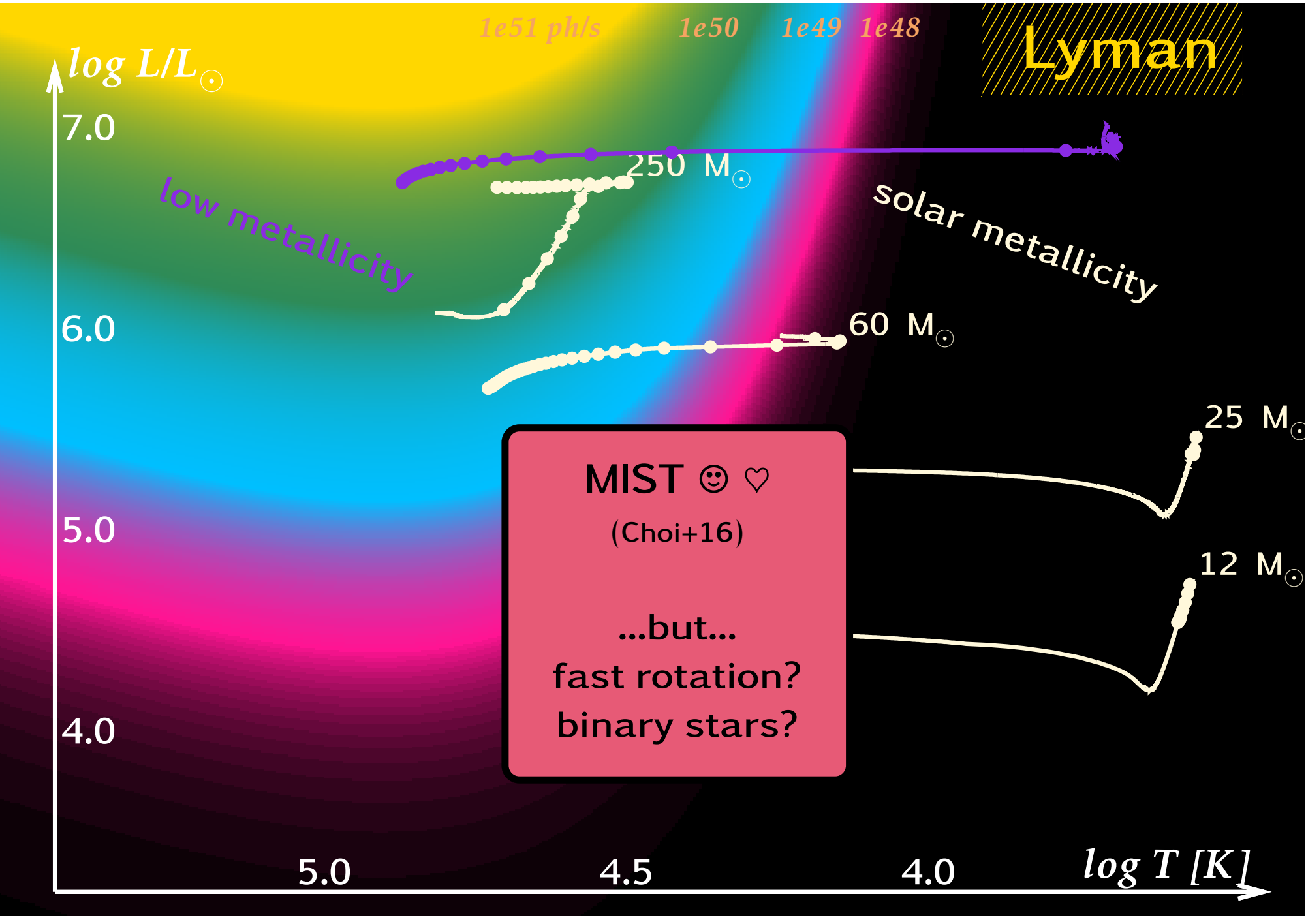

1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
'classic' stellar tracks
(Hurley+00)
↓
synthetic spectra of galaxies
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]

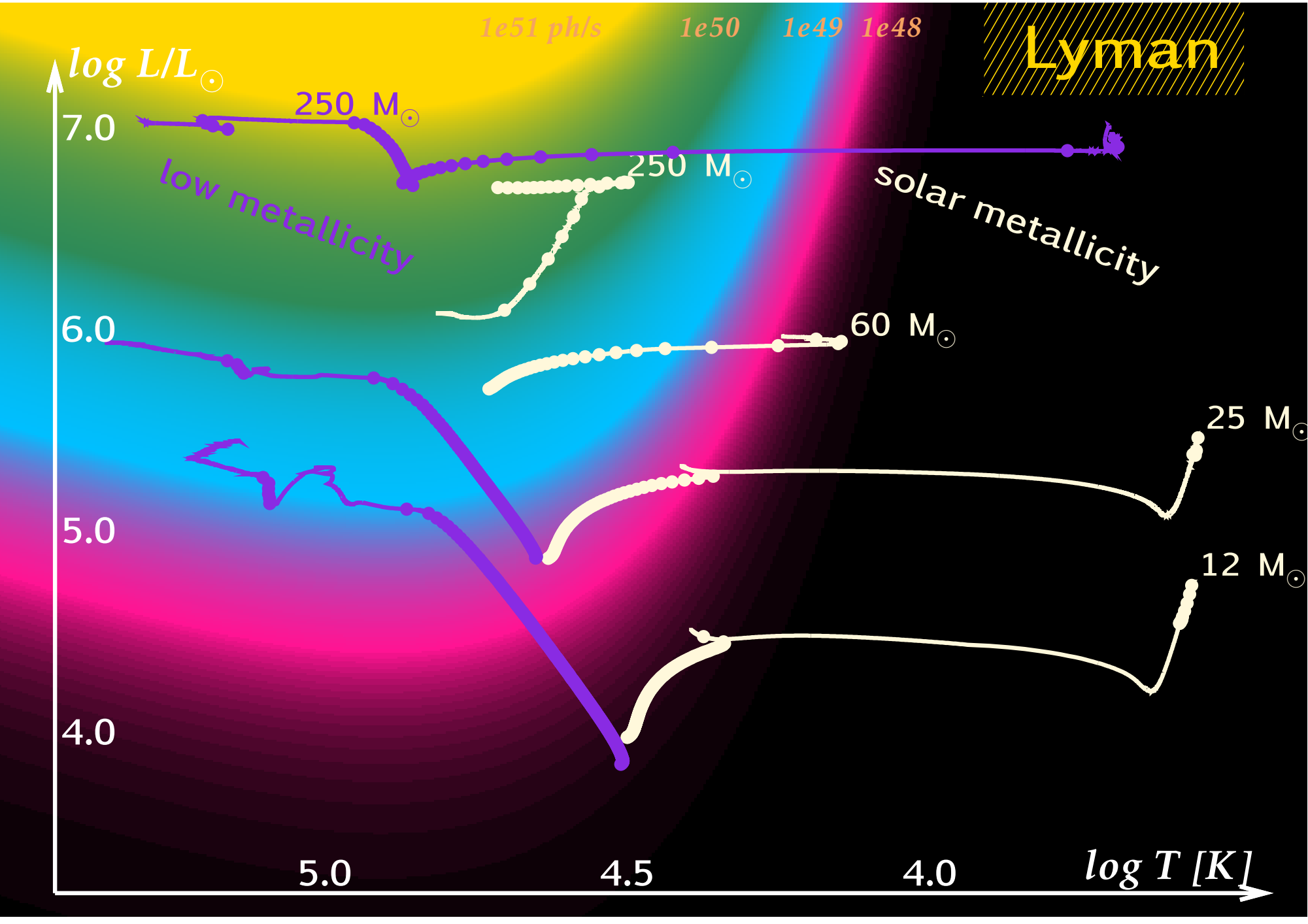

1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]

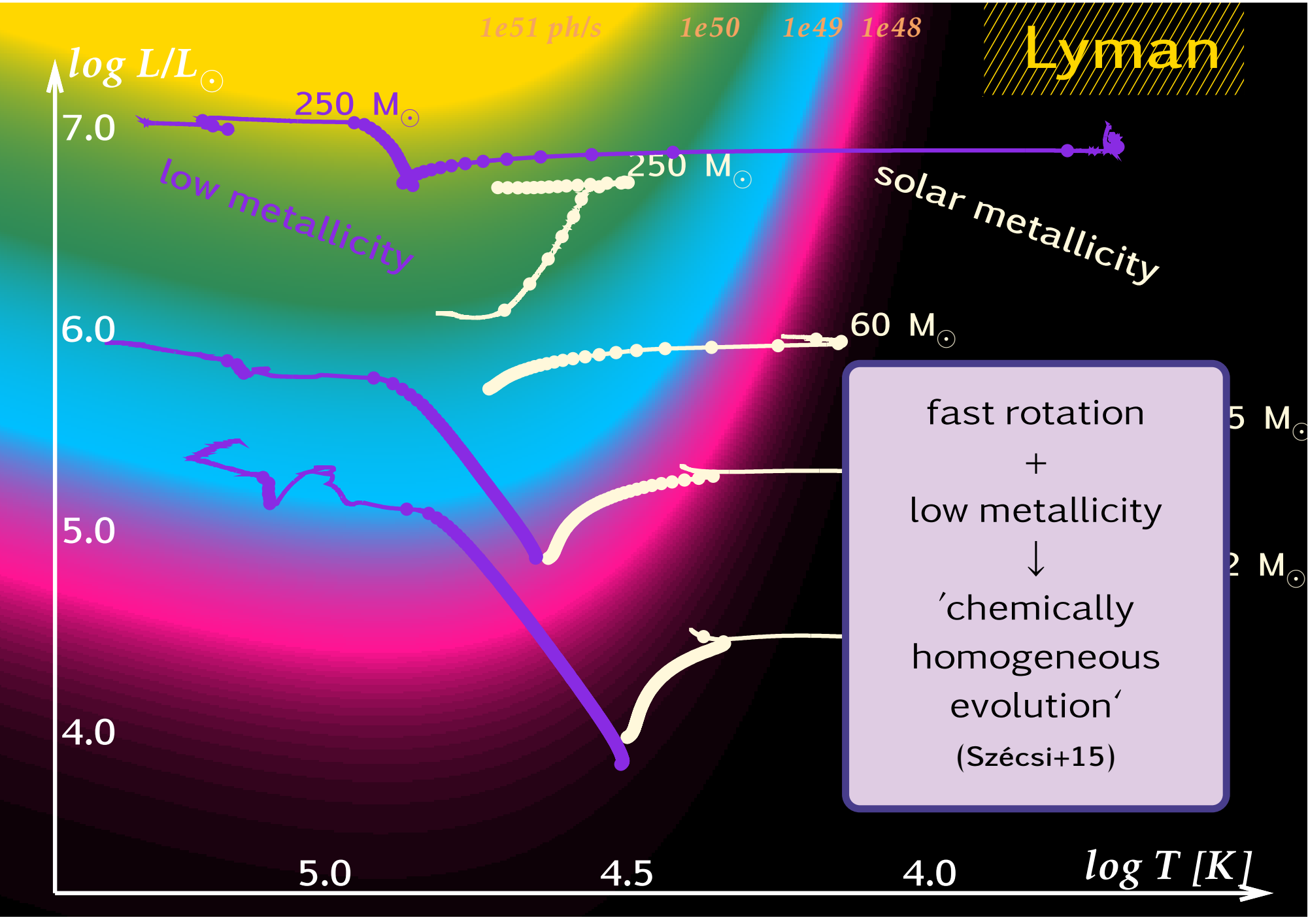

1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
60 M⊙
25 M⊙
12 M⊙
solar metallicity
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
low metallicity
solar metallicity
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
60 M⊙
25 M⊙
12 M⊙
low metallicity
solar metallicity
MIST ☺ ♡
(Choi+16)
...but...
fast rotation?
binary stars?
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
250 M⊙
low metallicity
solar metallicity
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]

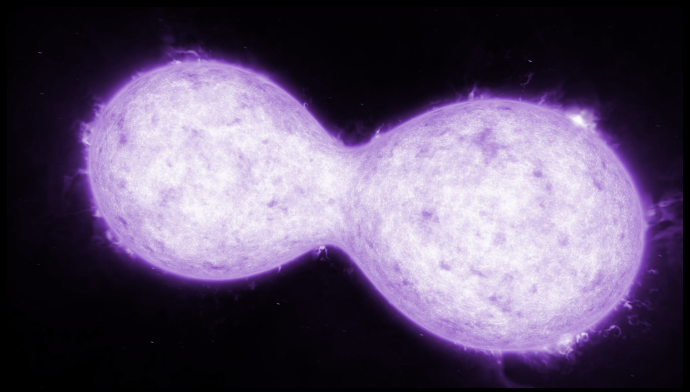

1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
250 M⊙
low metallicity
solar metallicity
60 M⊙
5 M⊙
2 M⊙
fast rotation
+
low metallicity
↓
'chemically
homogeneous
evolution'
(Szécsi+15)
5.0
4.5
4.0
log T [K]

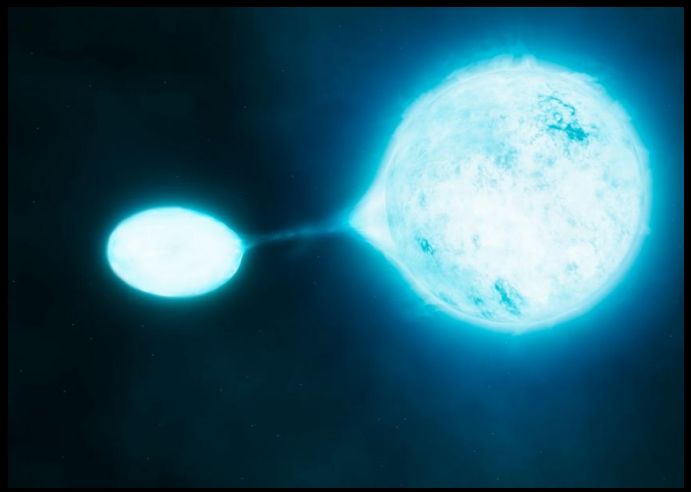
Binary stars!

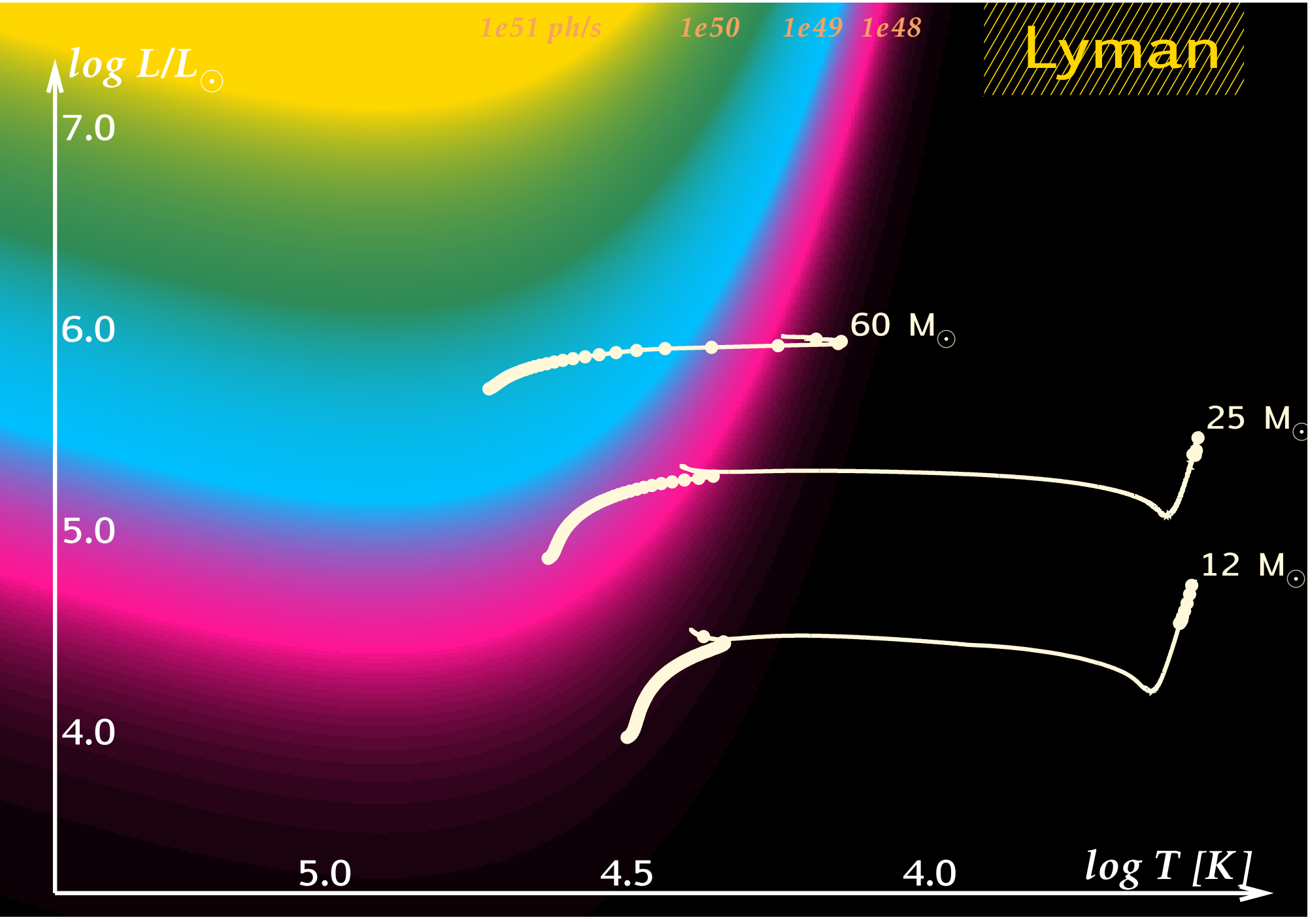
(Sana+12)

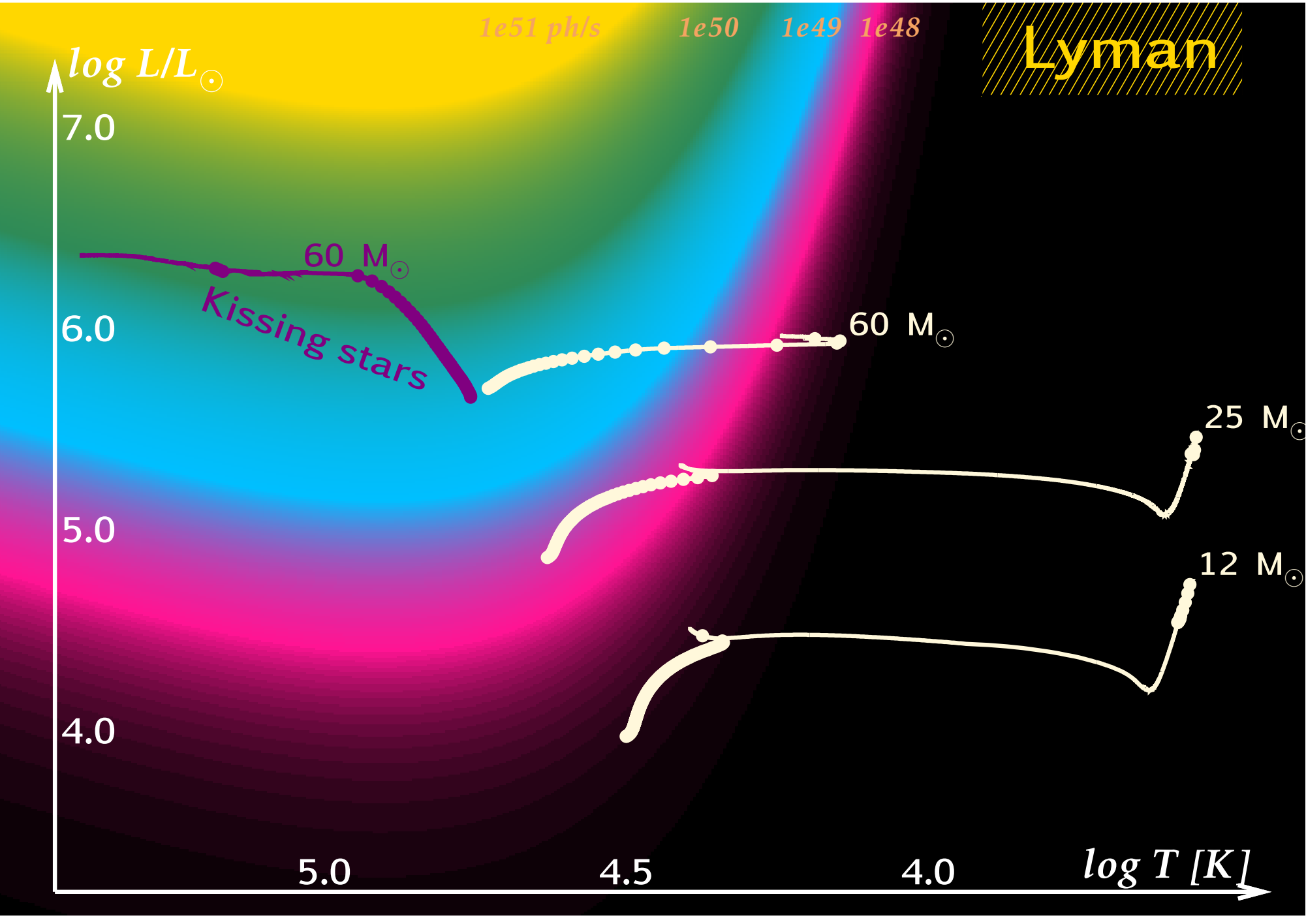
Binary stars!

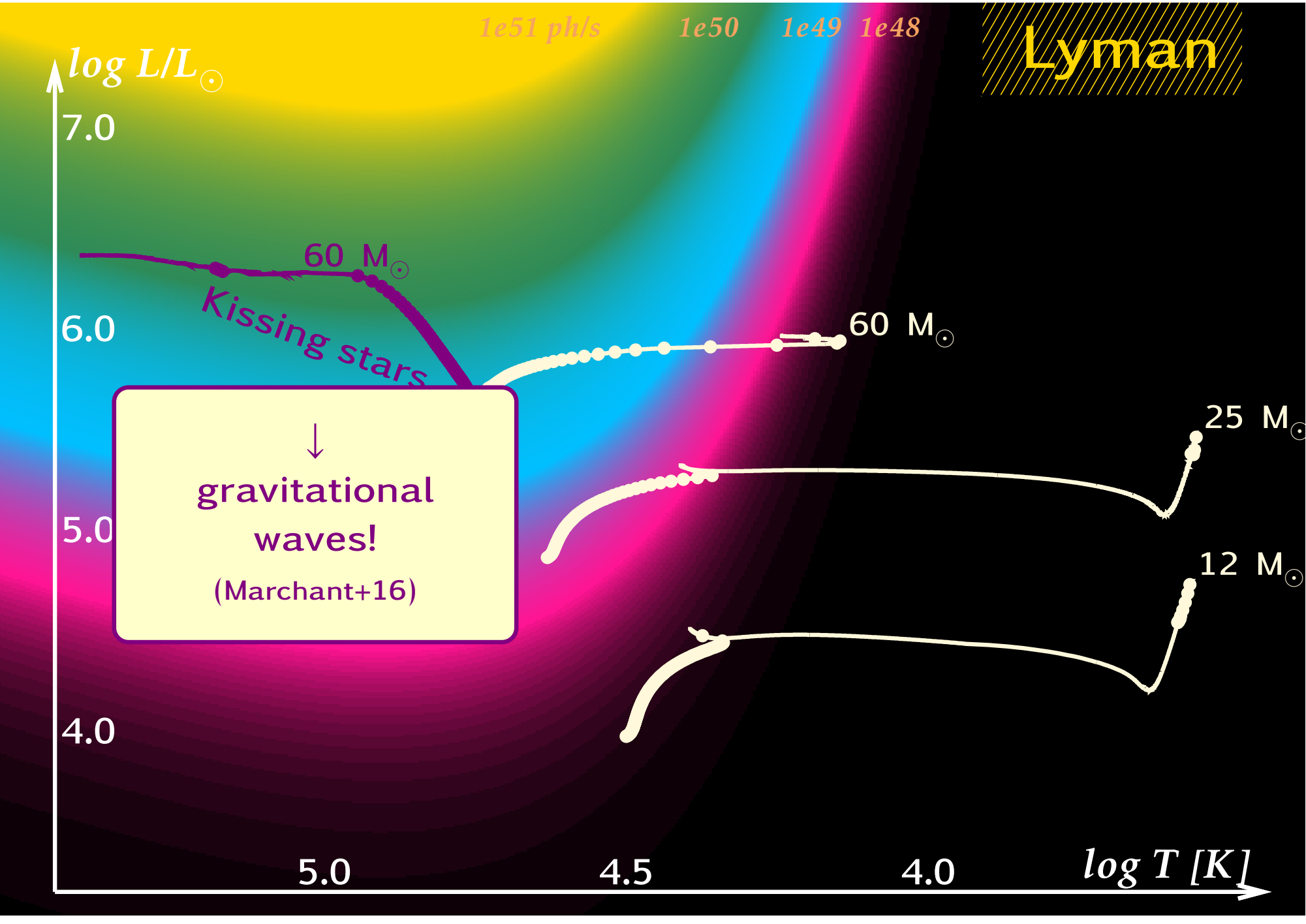
(Sana+12)

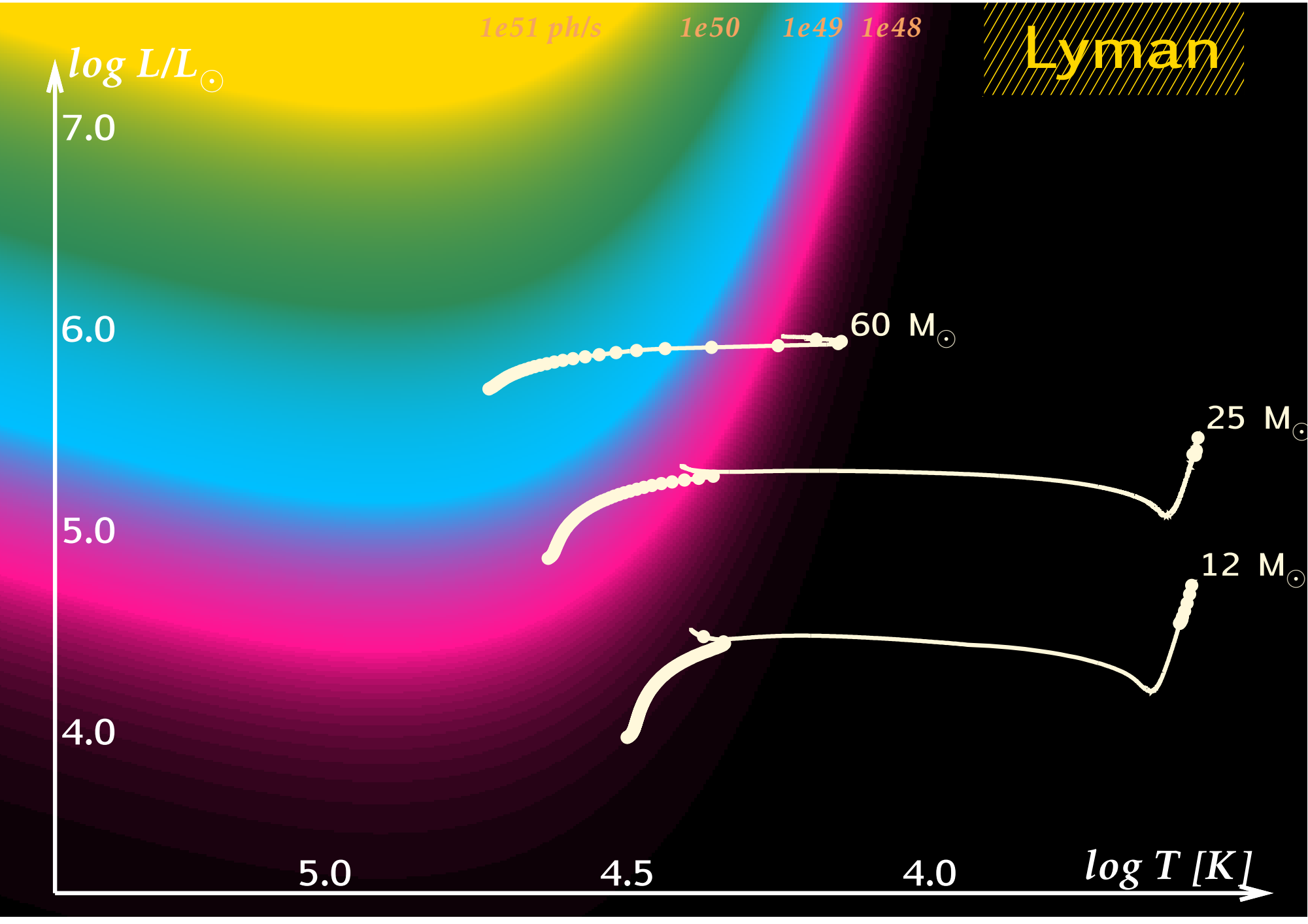


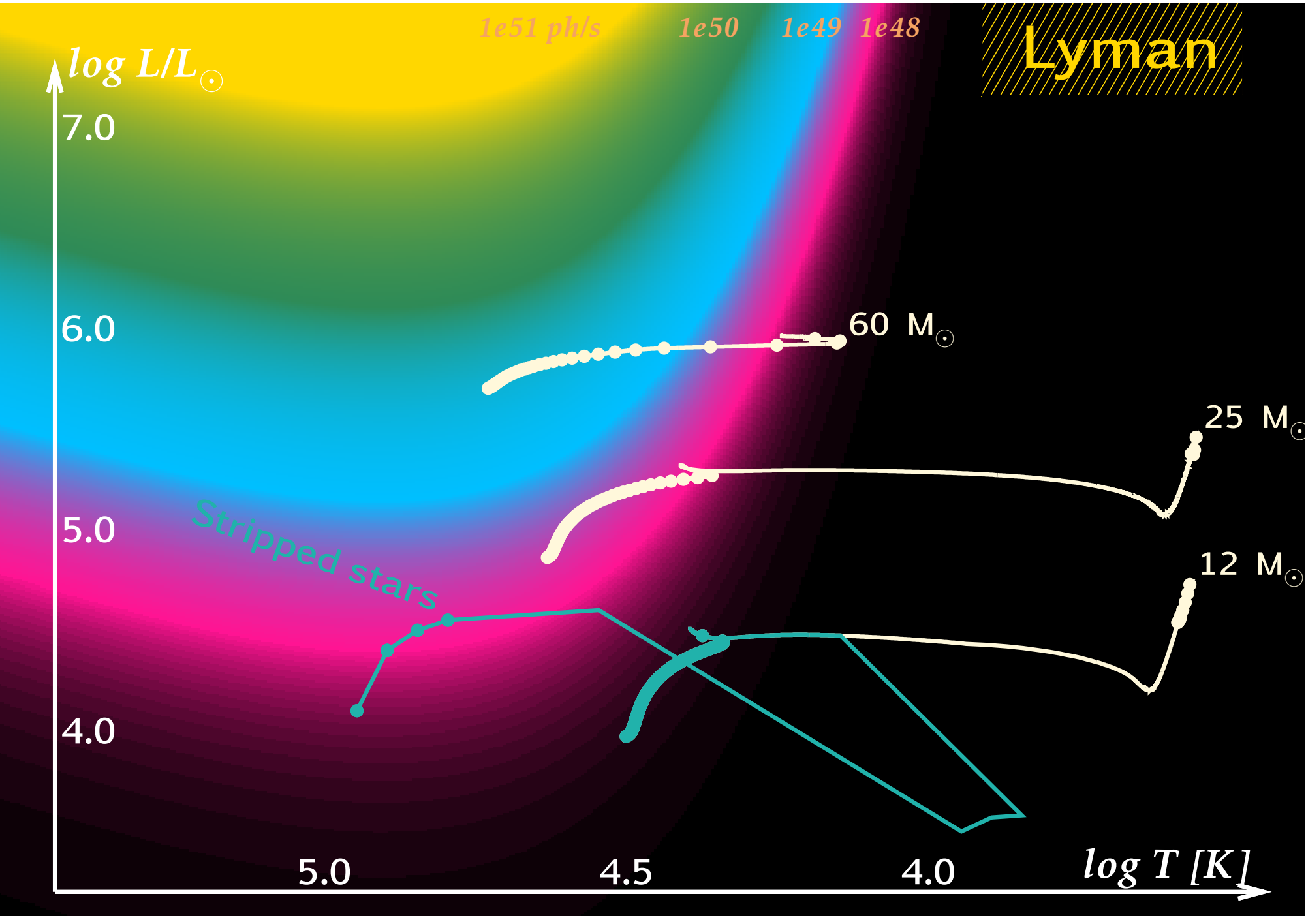


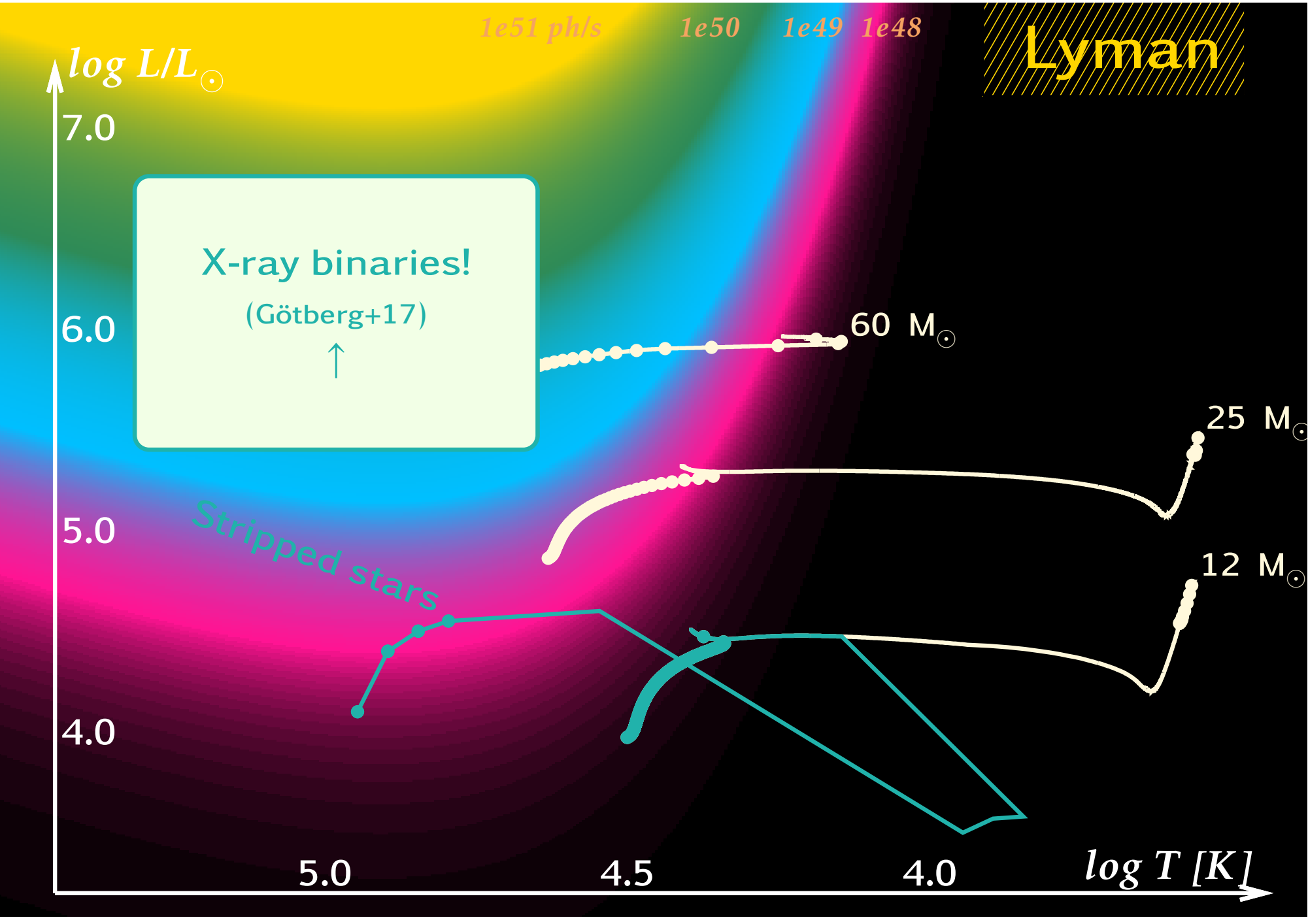

1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
60 M⊙
Kissing stars
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
60 M⊙
Kissing stars
60 M⊙
25 M⊙
12 M⊙
↓
gravitational
waves!
(Marchant+16)
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
60 M⊙
25 M⊙
12 M⊙
Stripped stars
5.0
4.5
4.0
log T [K]


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
X-ray binaries!
(Götberg+17)
60 M⊙
25 M⊙
12 M⊙
Stripped stars
5.0
4.5
4.0
log T [K]

Some notes...

Some notes...

- lowest metallicity ★-detection *ever*: 0.1 $Z_{\odot}$

Some notes...

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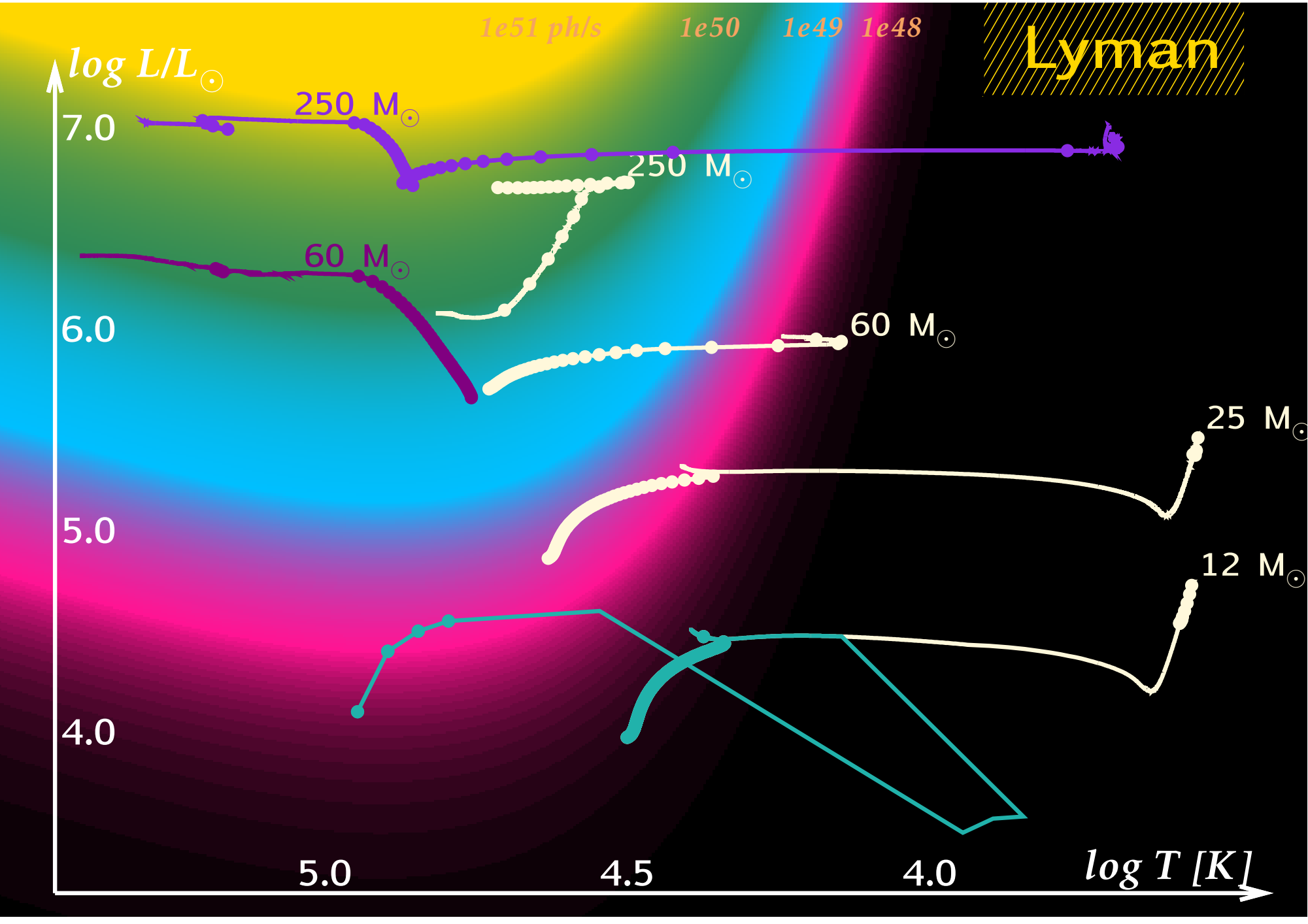
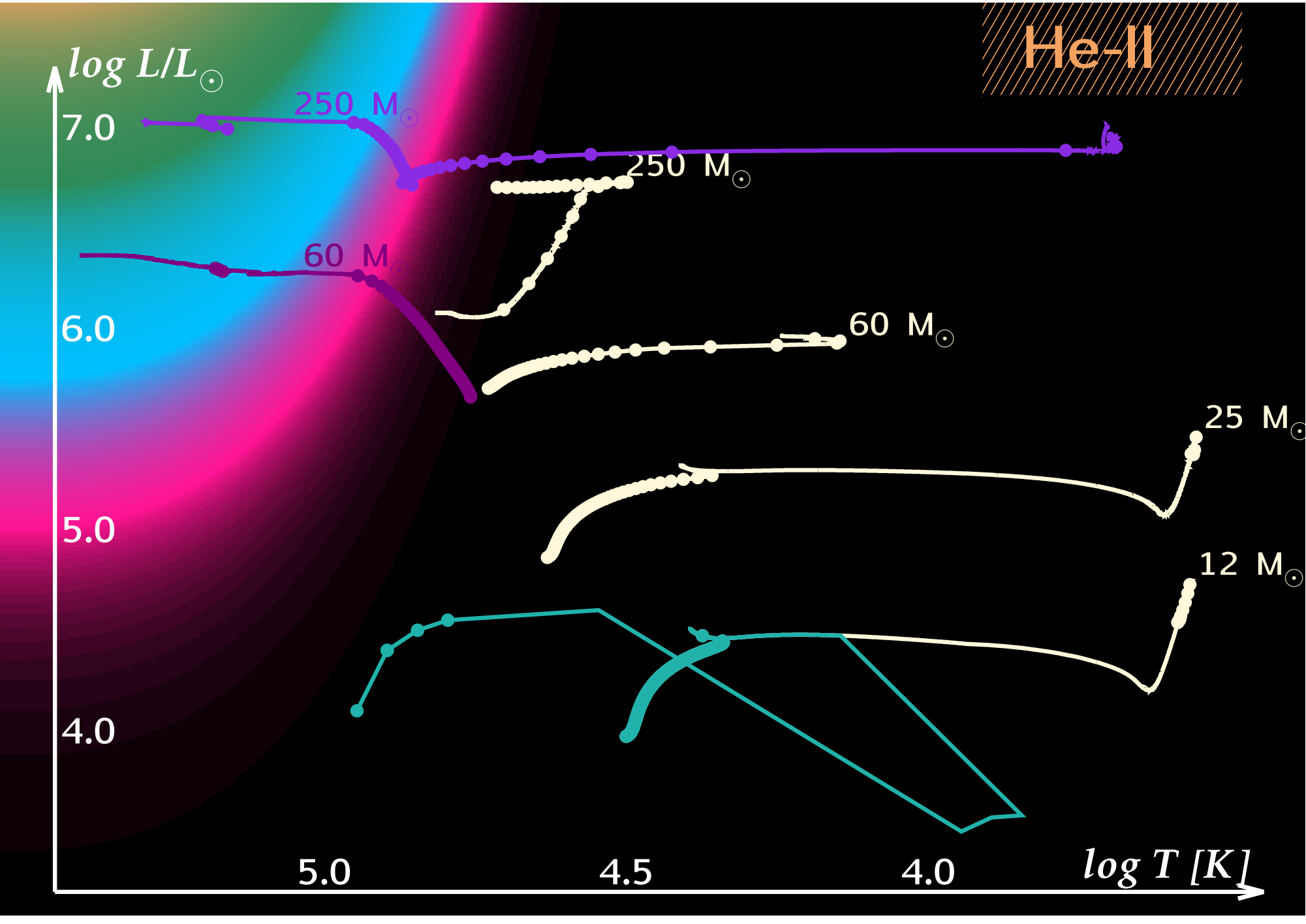
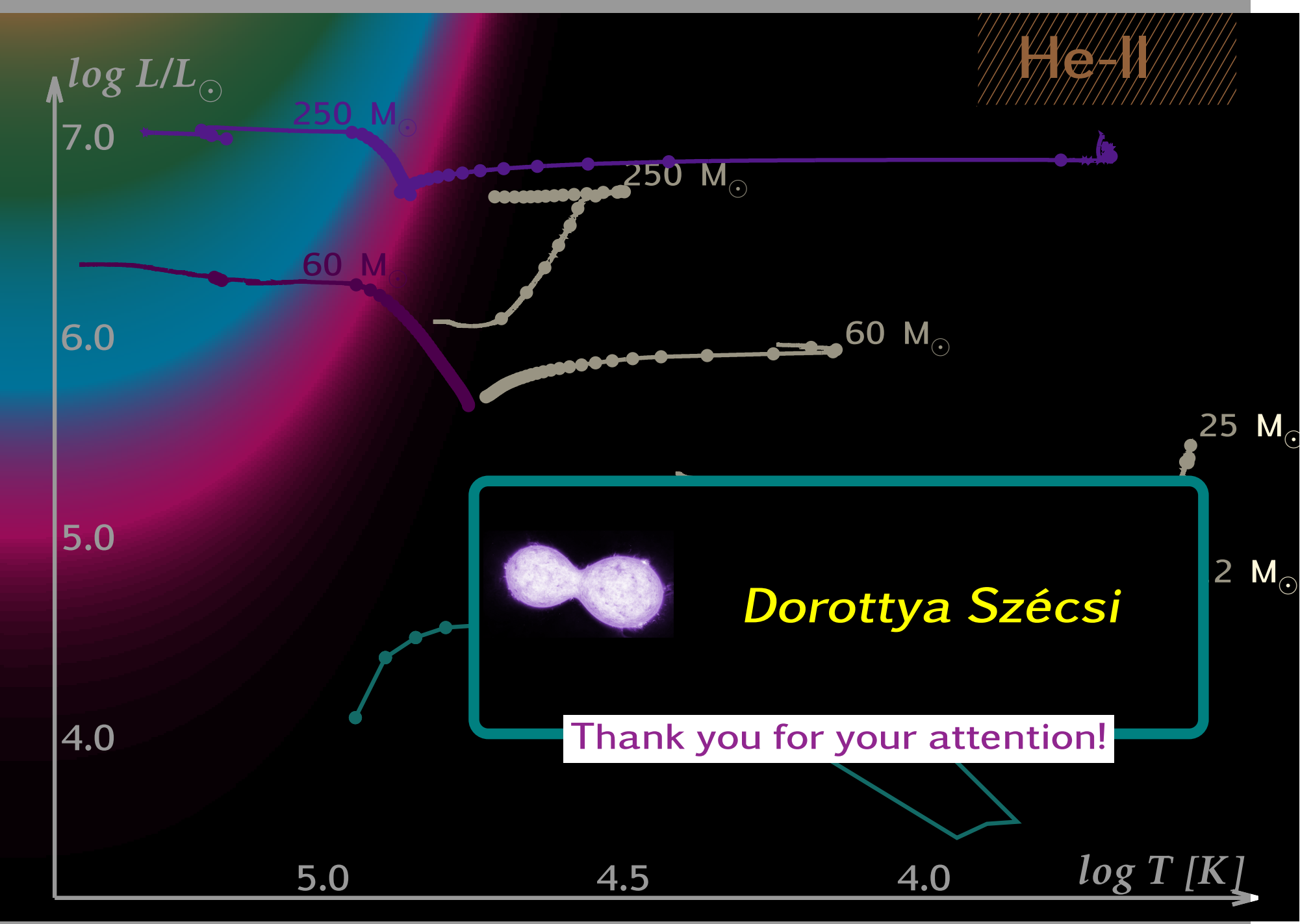
- use BPASS ☺😇

Some notes...

- lowest metallicity ★-detection *ever*: 0.1 $Z_\odot$
- use BPASS ☺😇
- be flexible!


1e51 ph/s
1e50
1e49
1e48
Lyman
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
250 M⊙
60 M⊙
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]


He-II
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
250 M⊙
60 M⊙
60 M⊙
25 M⊙
12 M⊙
5.0
4.5
4.0
log T [K]


He-II
log L/L⊙
7.0
6.0
5.0
4.0
250 M⊙
250 M⊙
60 M⊙
60 M⊙
25 M⊙
2 M⊙
Dorottya Szécsi
Thank you for your attention!
5.0
4.5
4.0
log T [K]