Running stars

NASA, JPL-Caltech, Spitzer Space Telescope

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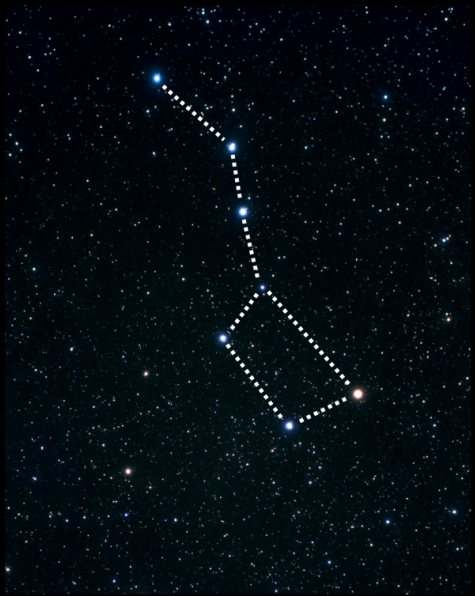
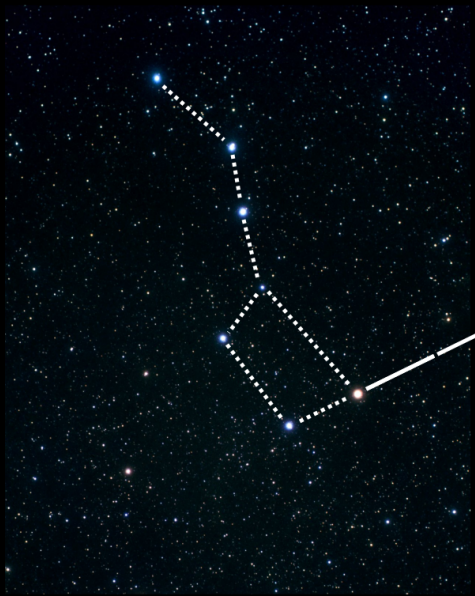


The big dipper

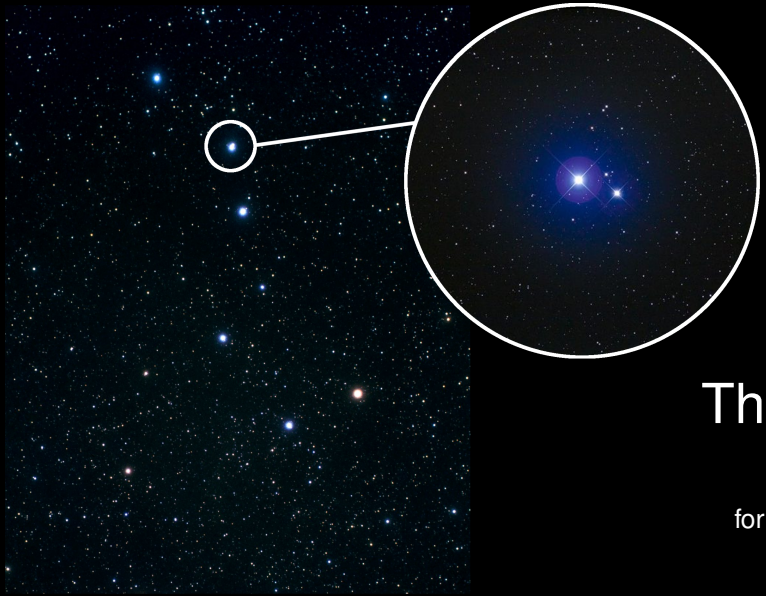


The big dipper

The big dipper

as eyesight test

for ancient astronomers



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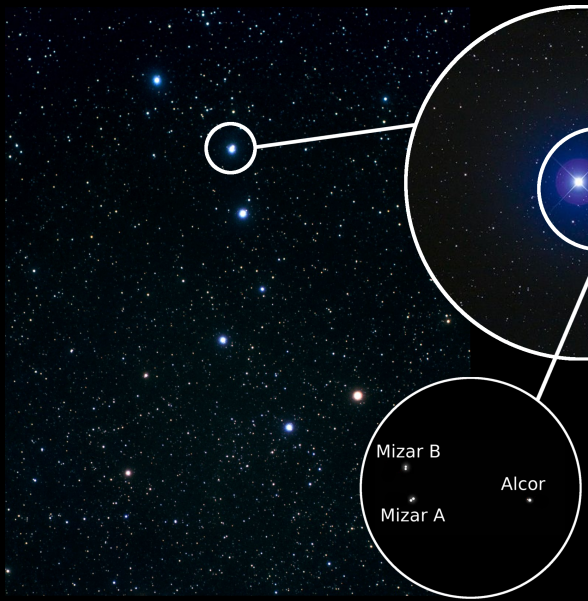


Unlike the Sun

Most stars are binaries

(or triples, quadruples, etc...)

Where are stars born?

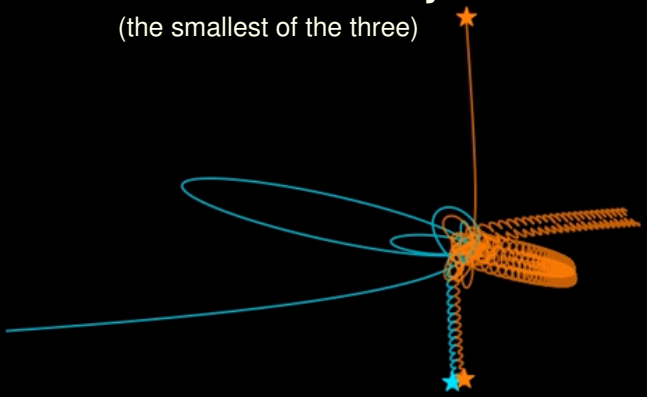
Stellar “nurseries” are crowded places

Credits: C. Rodriguez

Typical result:

One star runs away

(the smallest of the three)



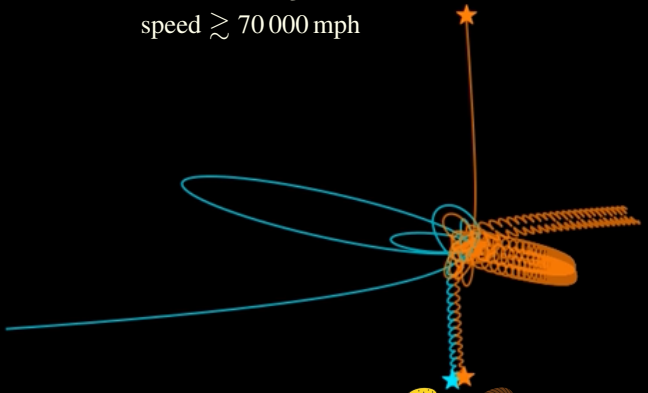
The two biggest stars pair together

Typical result:

Actual scientific terms!

Runaway star

speed $\gtrsim$ 70 000 mph

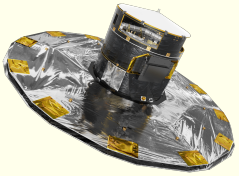


“Bully binary”

Fuji & Portegie-Zwart 2011

How can we find runaways and “bully” binaries?

We need space telescopes to track how stars move

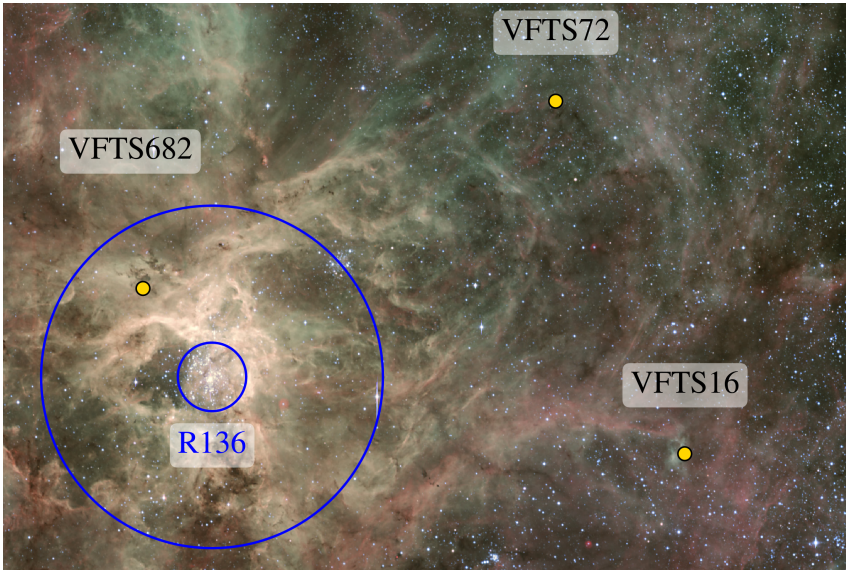


gaia

Anyone can download the data!

The biggest runaway star known

The most massive runaways known is more than $140\times$ the Sun



Renzo *et al.* 2019a

Lennon *et al.* (incl. MR) 2018

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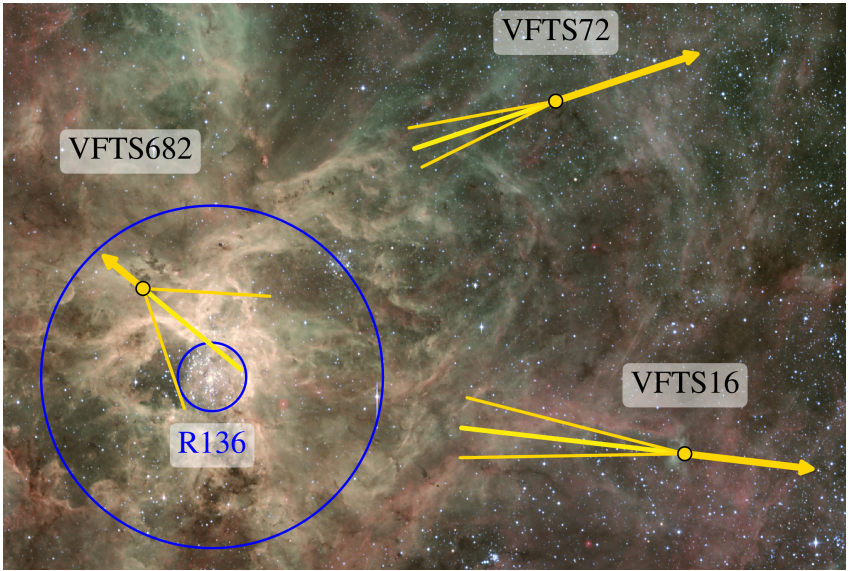

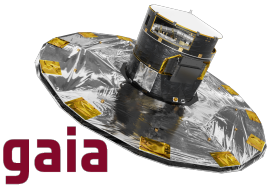

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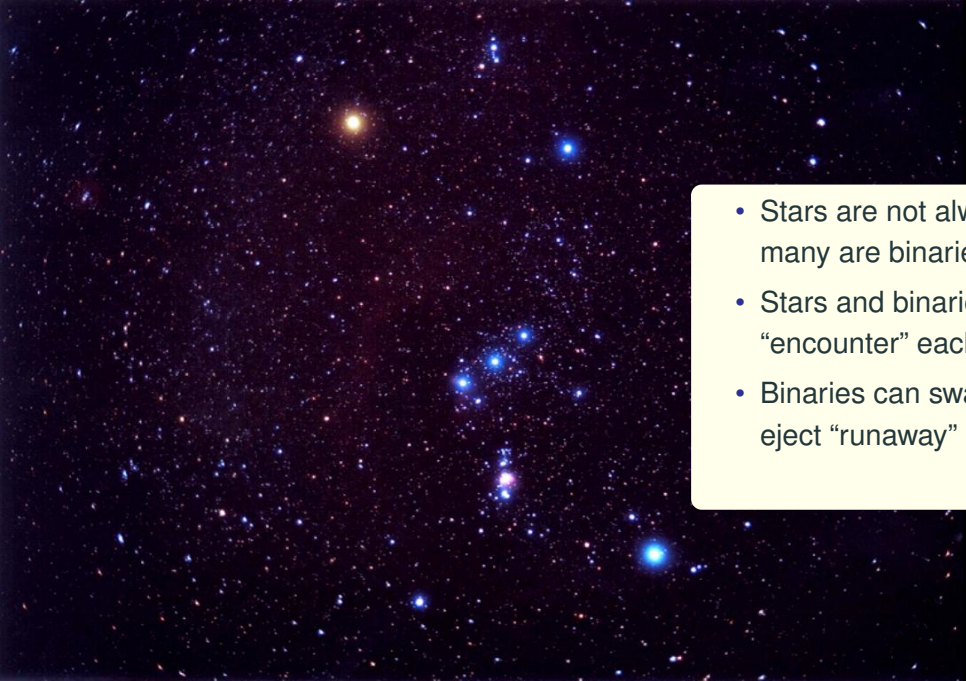
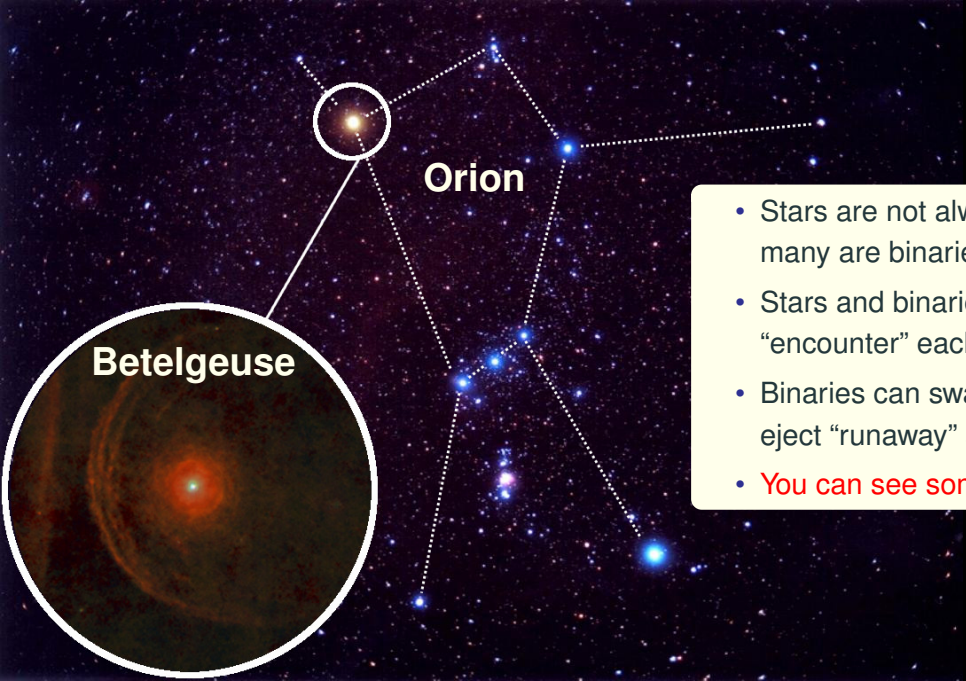
Conclusions



- Stars are not always alone – many are binaries
- Stars and binaries can “encounter” each other
- Binaries can swap members and eject “runaway” stars

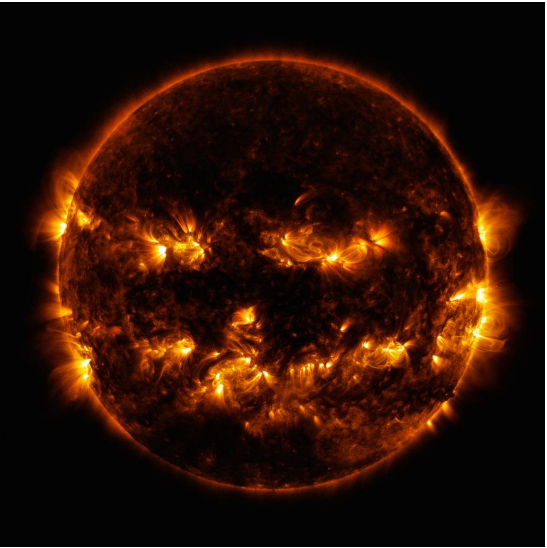


- Stars are not always alone – many are binaries
- Stars and binaries can “encounter” each other
- Binaries can swap members and eject “runaway” stars
- You can see some by naked eye!

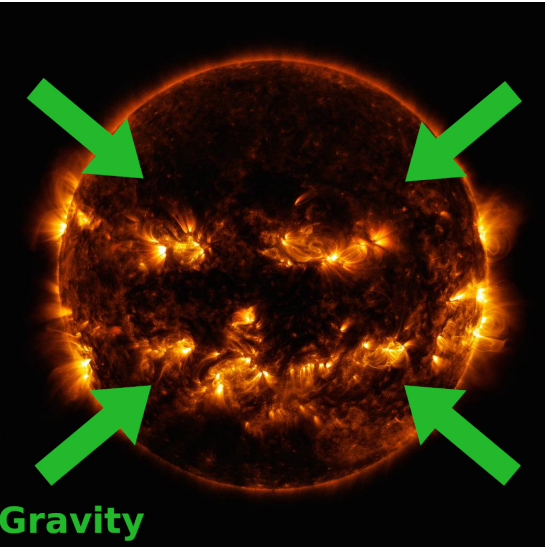
Backup slides

What is a star?

The nearest star to us is the Sun

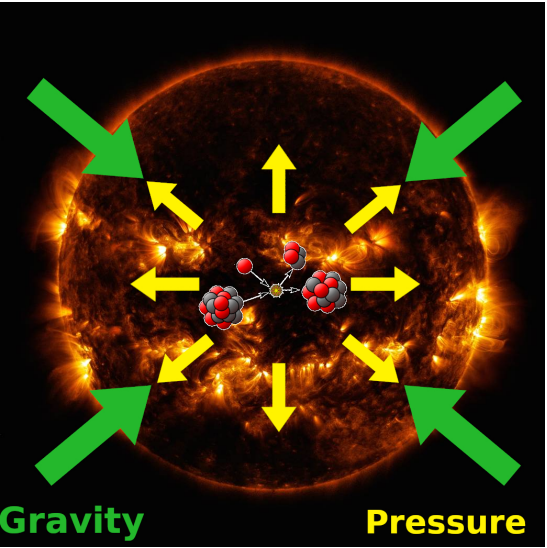


Stars are large balls of matter that “resist” their own weight



Pushing against gravity
costs energy

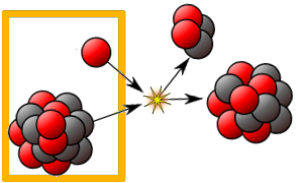
Stars produce their own energy by nuclear fusion



Pushing against gravity
costs energy

⇓

To produce energy, stars
create new elements



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They run out of “fuel”
and are forced to evolve

Bow shocks

Looking at how stars move is the oldest form of astronomy...

... but it still yields surprises today!