Horizon 2020
European Union Funding
for Research & Innovation
Massive stars
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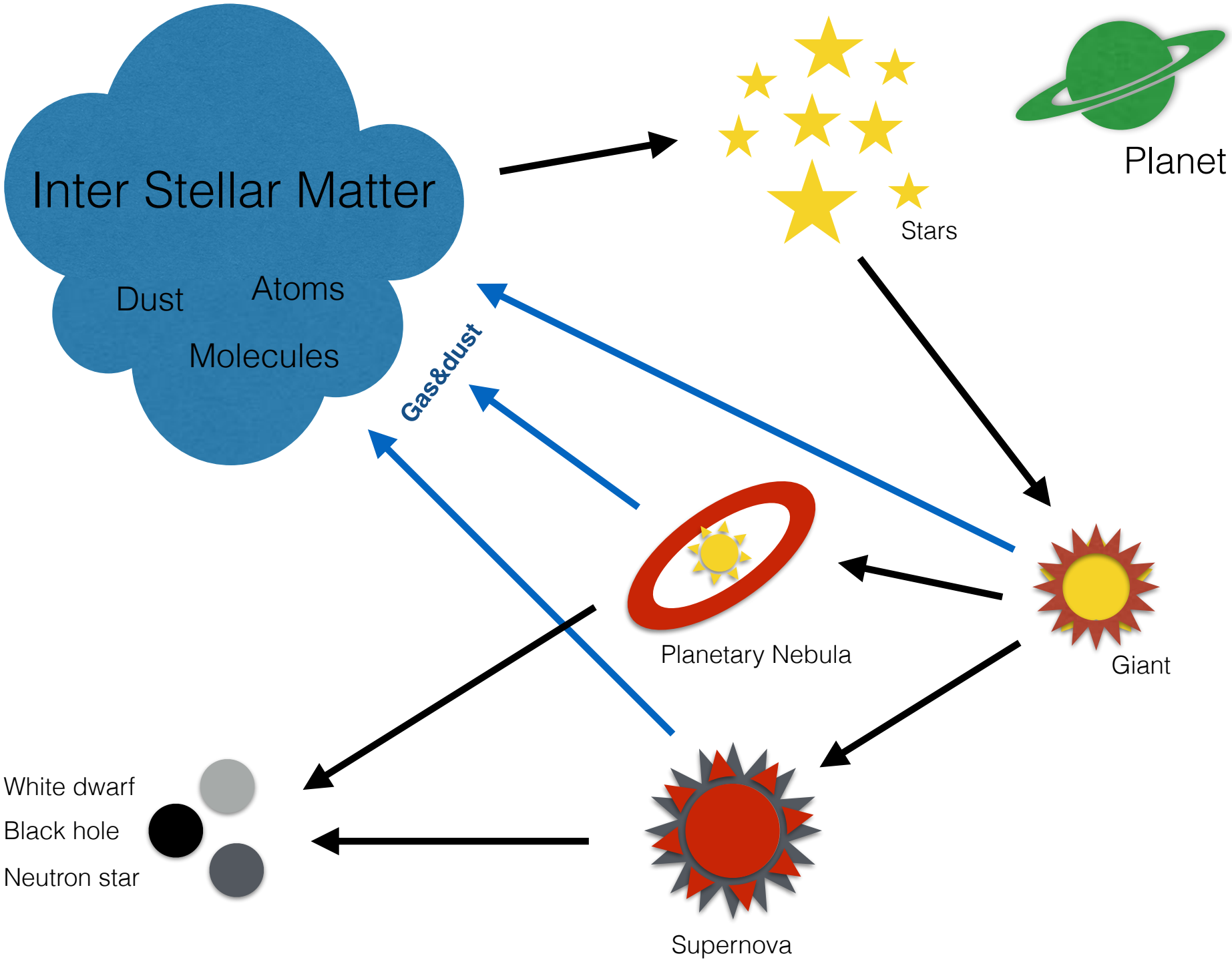
CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD
SFM
STARFORMMAPPER

What is in the sky?
Stars + planets
Inter Stellar Medium
Gas+Dust+Cosmic rays


Inter Stellar Matter
Dust
Atoms
Molecules
Stars
Planet
Gas&dust
Planetary Nebula
Giant
White dwarf
Black hole
Neutron star
Supernova

If stars born in clusters why most of the stars in the sky are not in clusters?!

Most of the clusters disrupt within 10 Myr

Feedback from the massive stars, gas-removal phase, dynamical initial condition

! If sun was a human who could live up to 100 years

Right now, sun has 46 years :)

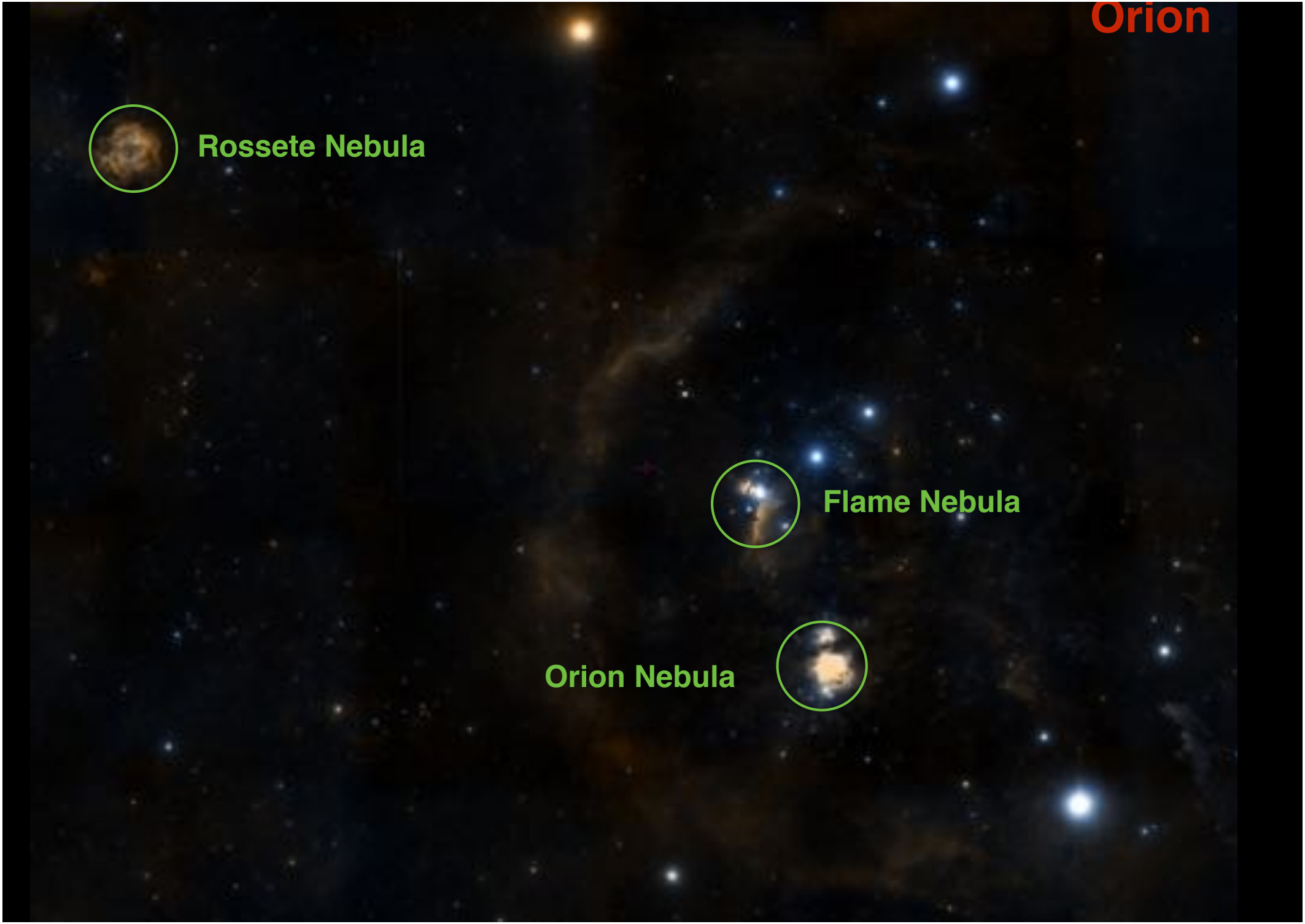
Mass	Age
Solar-mass	As they were human
Age of the Universe	138 years
1	100 years
1.5	30 years
3	3.7 years
10	4 month
30	40 days
60	11 days!
Cluster's dissolution time	2 months!

Massive stars

1) Evolve very fast (very short life)

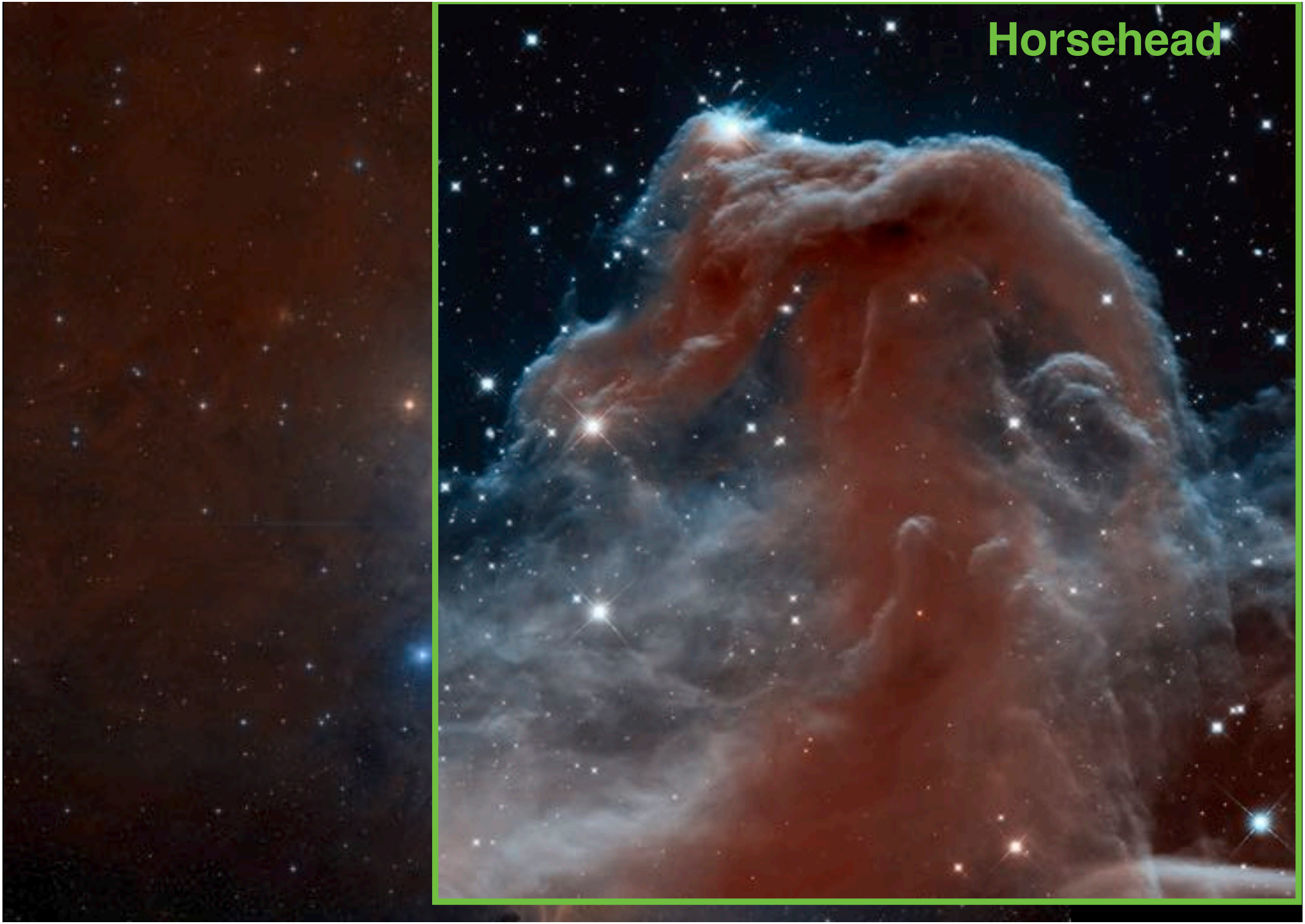
2) Enrich their environment by producing heavy elements

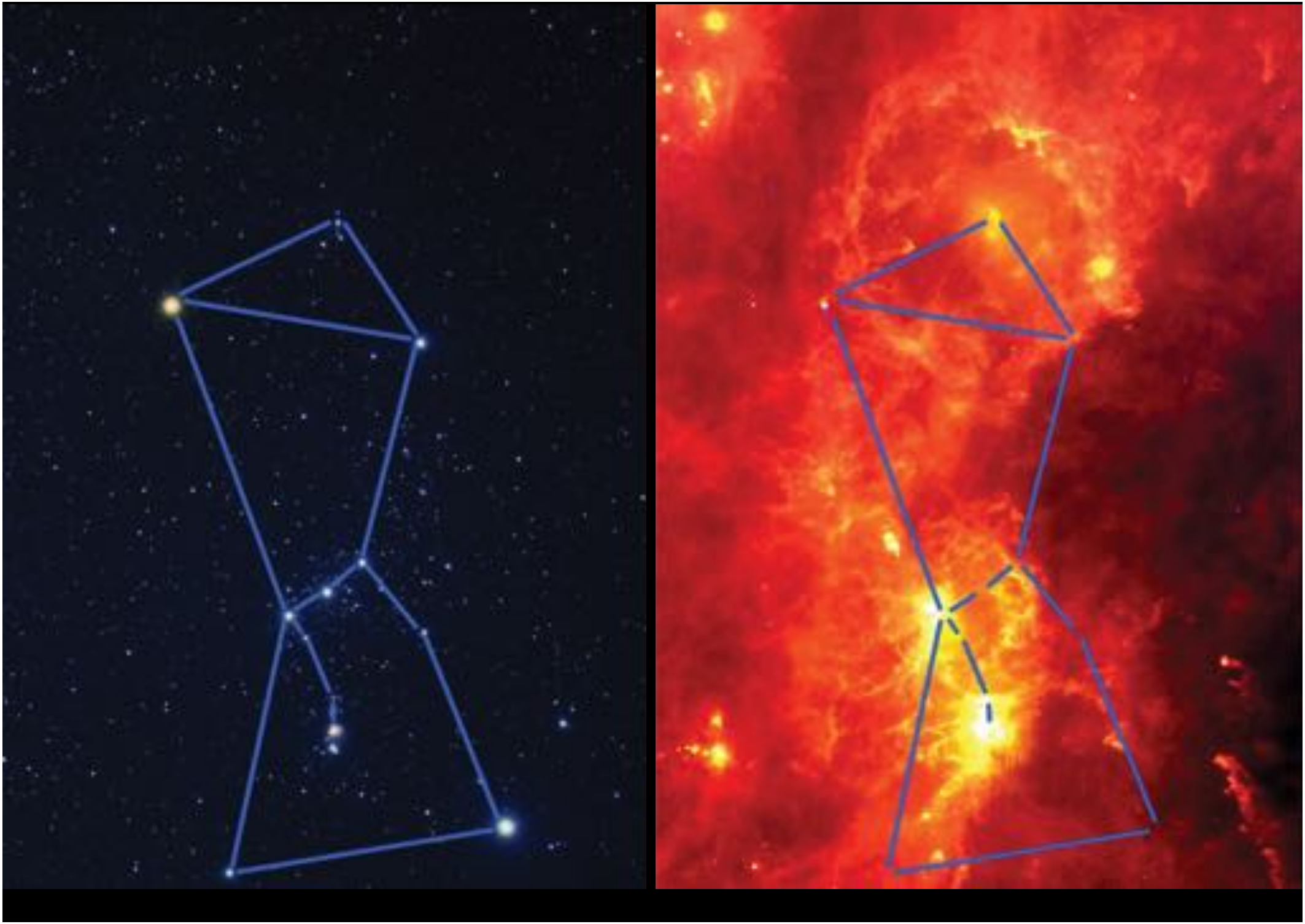
3) Inject energy into ISM


Orion
Rossete Nebula
Flame Nebula
Orion Nebula

Orion Nebula
Nearest star-forming region
Distance:1400ly
M43: massive young star
Trapezium cluster
Combination of 520 Hubble images
in 5 colours

Flame Nebula


Horsehead



Star formation

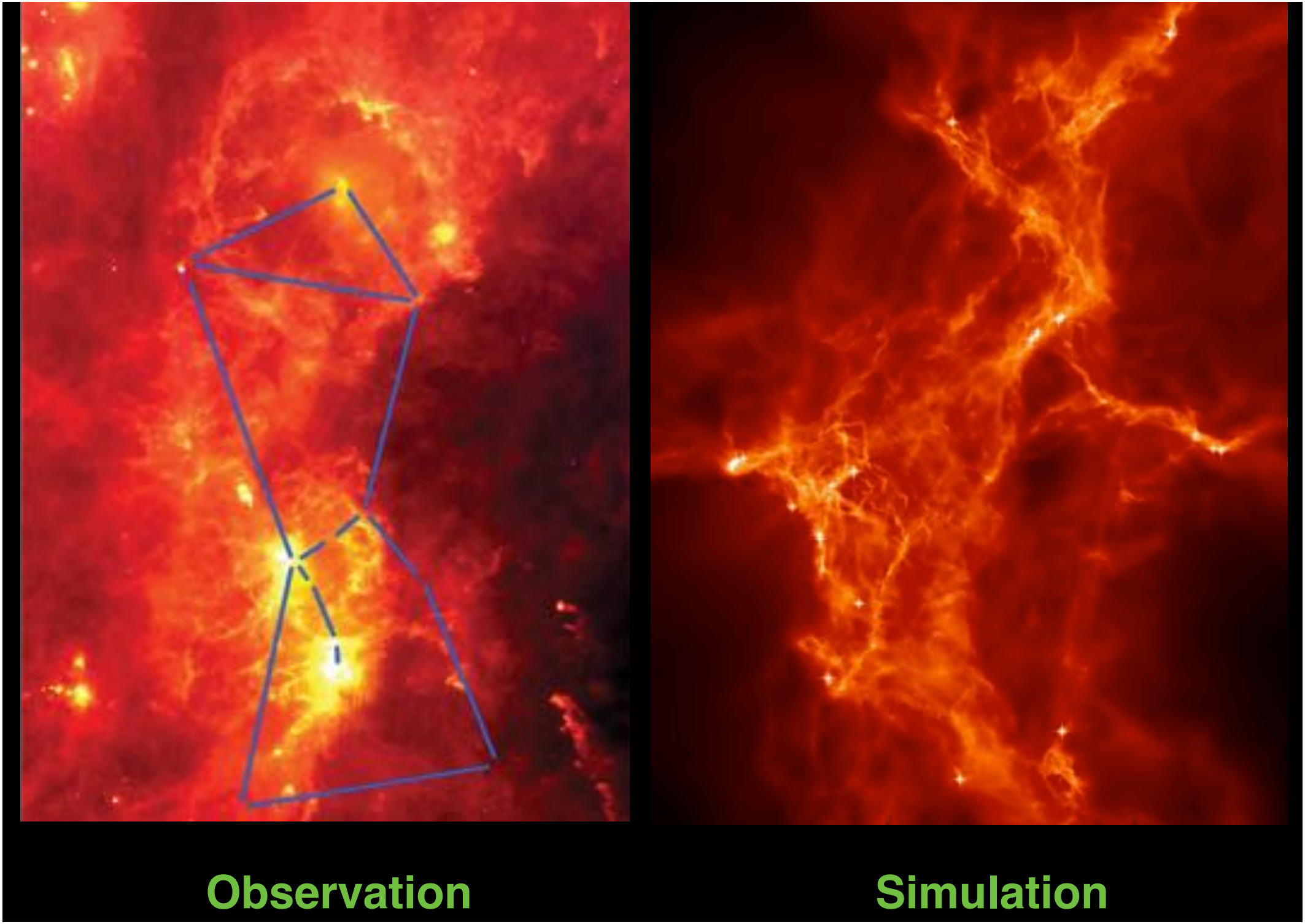
- Stars form from giant clouds of molecular gas and dust
- Shockwaves disrupt the stable giant cold clouds and cause material to compress, condense and collapse into stars
- Gas cloud collapse due to gravity
- Core becomes hotter and density inside the core increases
- Nuclear fusion happens:

  H—> He —> heavier elements

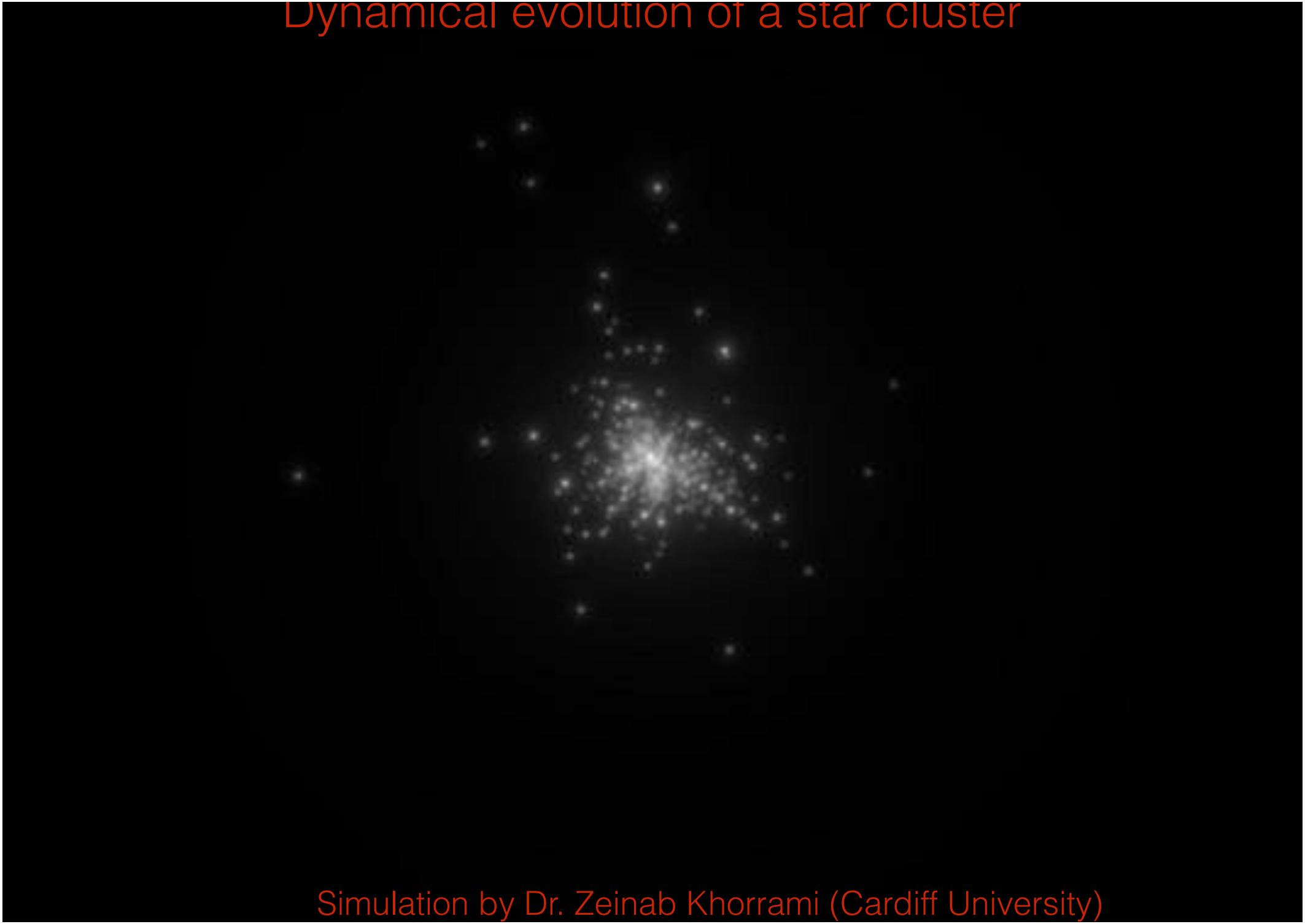
- Star shines and releases energy!

Star cluster formation

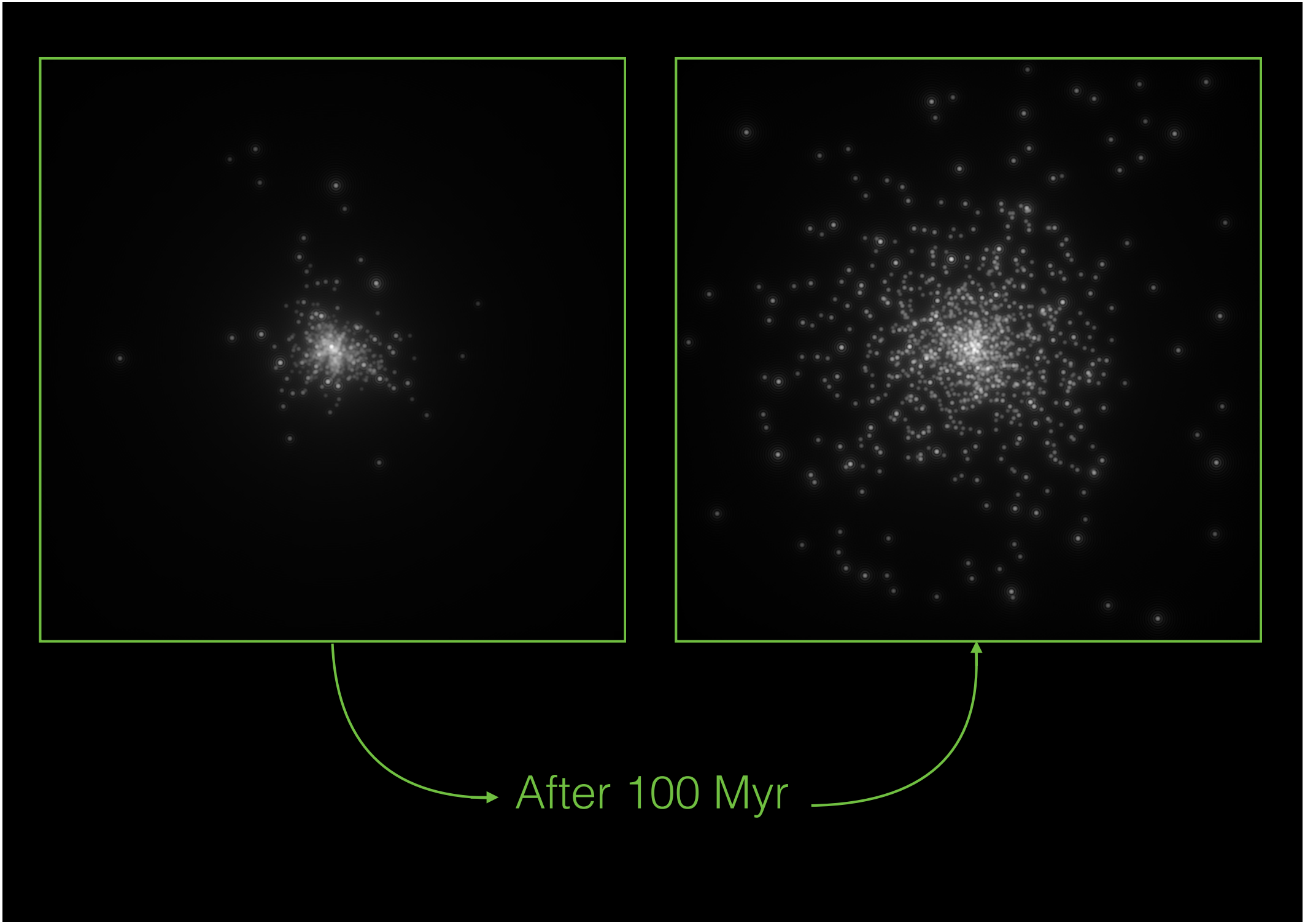
Simulation by Dr. Paul Clark (Cardiff University)


Observation
Simulation

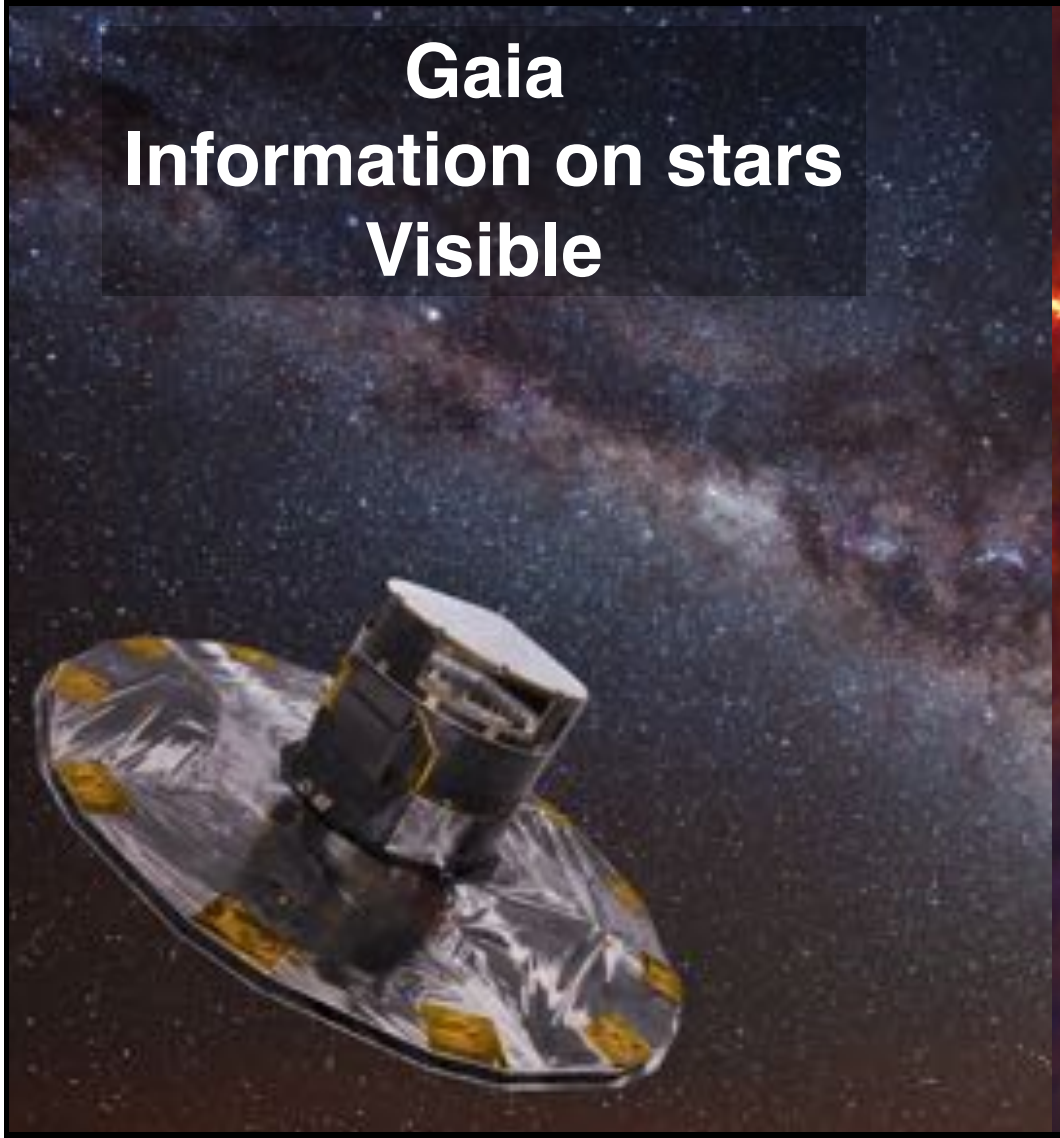
Dynamical evolution of a star cluster

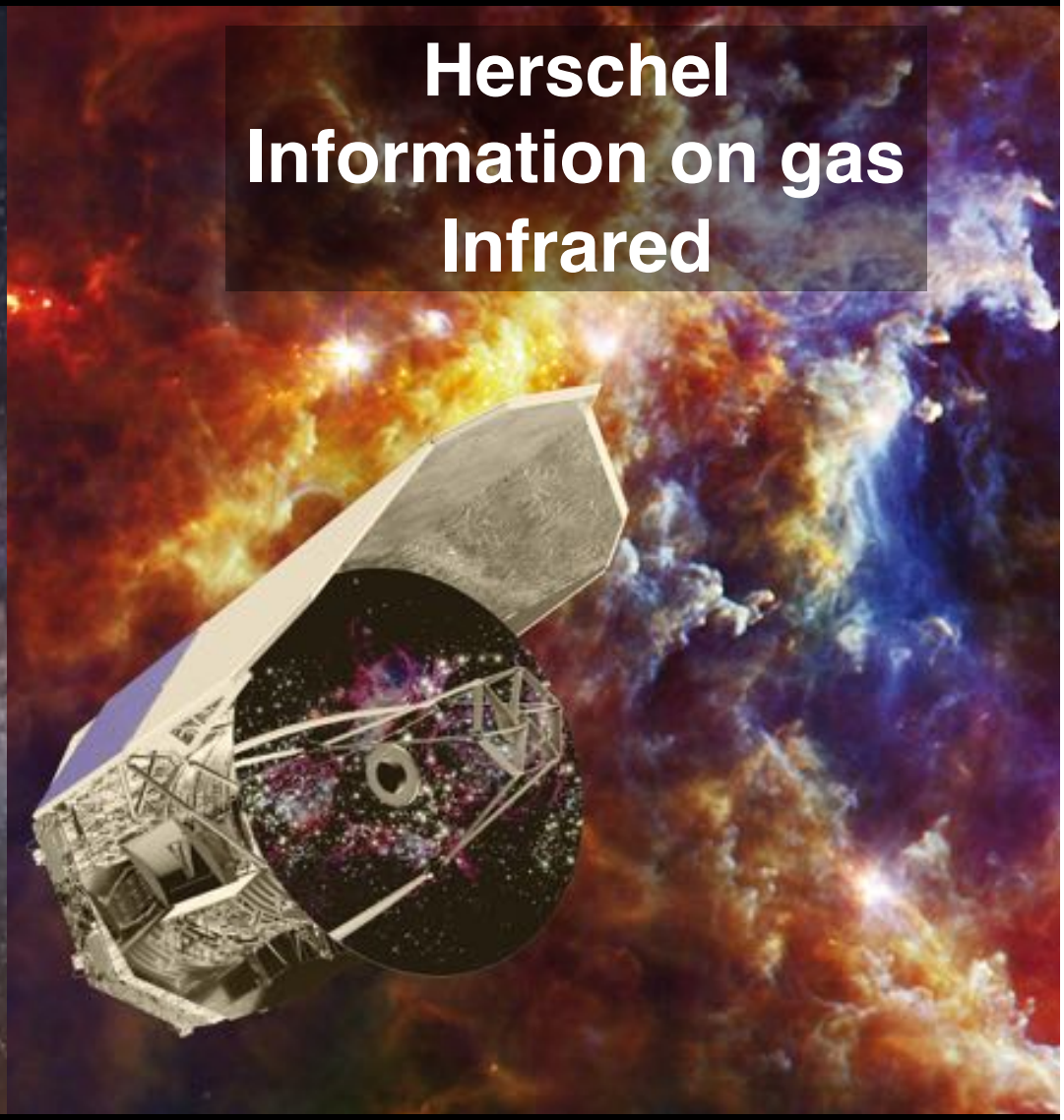


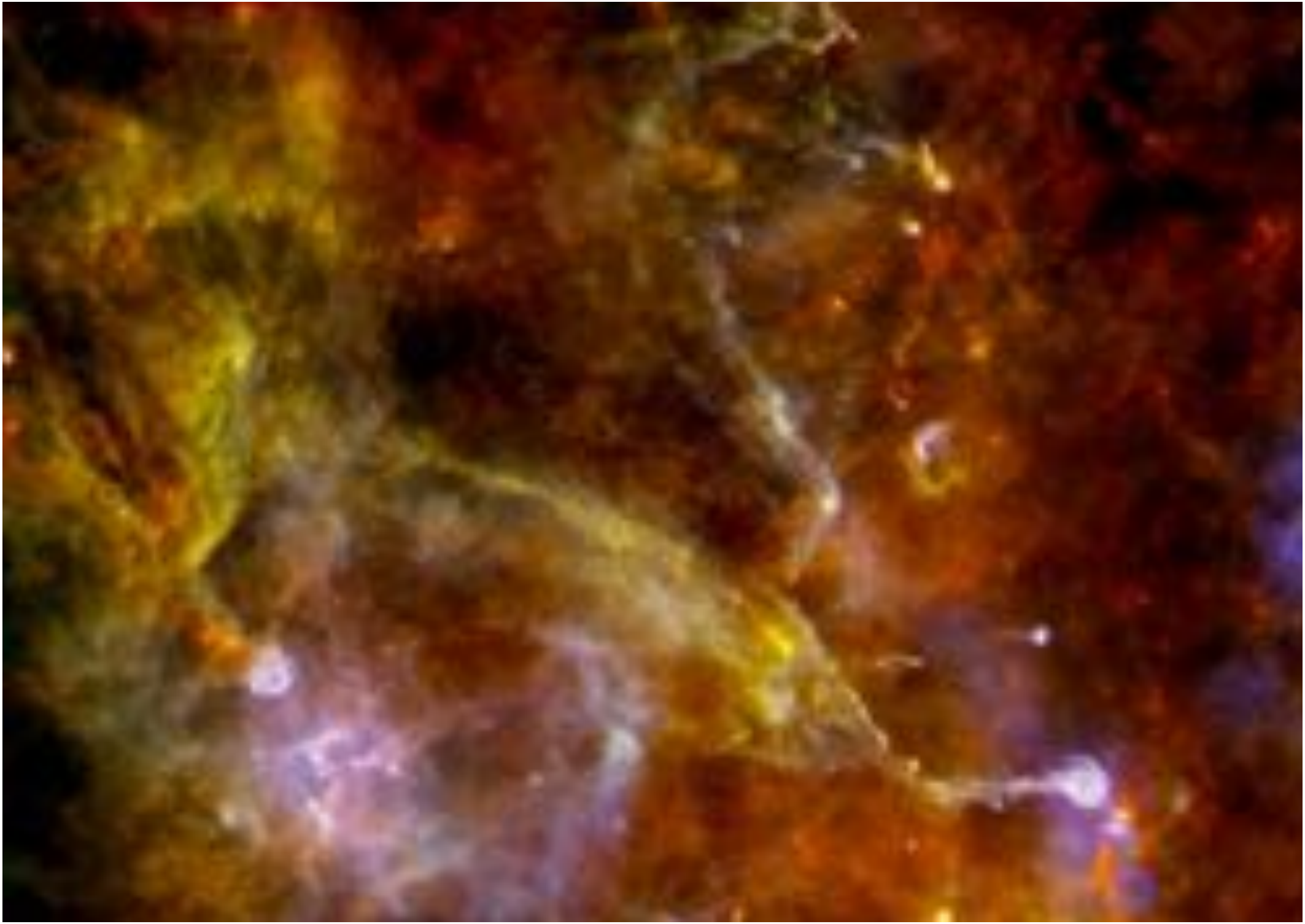
Simulation by Dr. Zeinab Khorrami (Cardiff University)


After 100 Myr

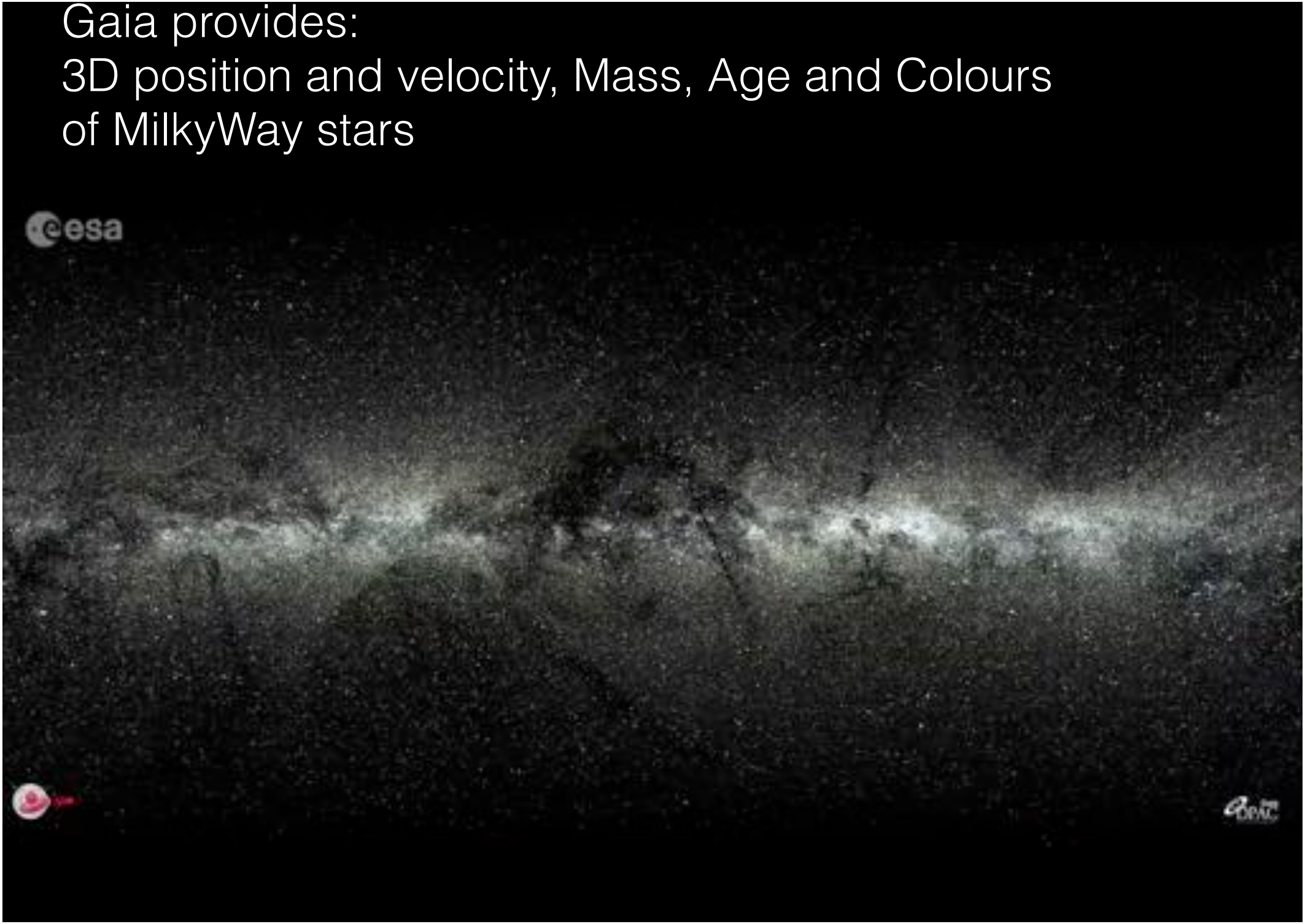
Star Form Mapper



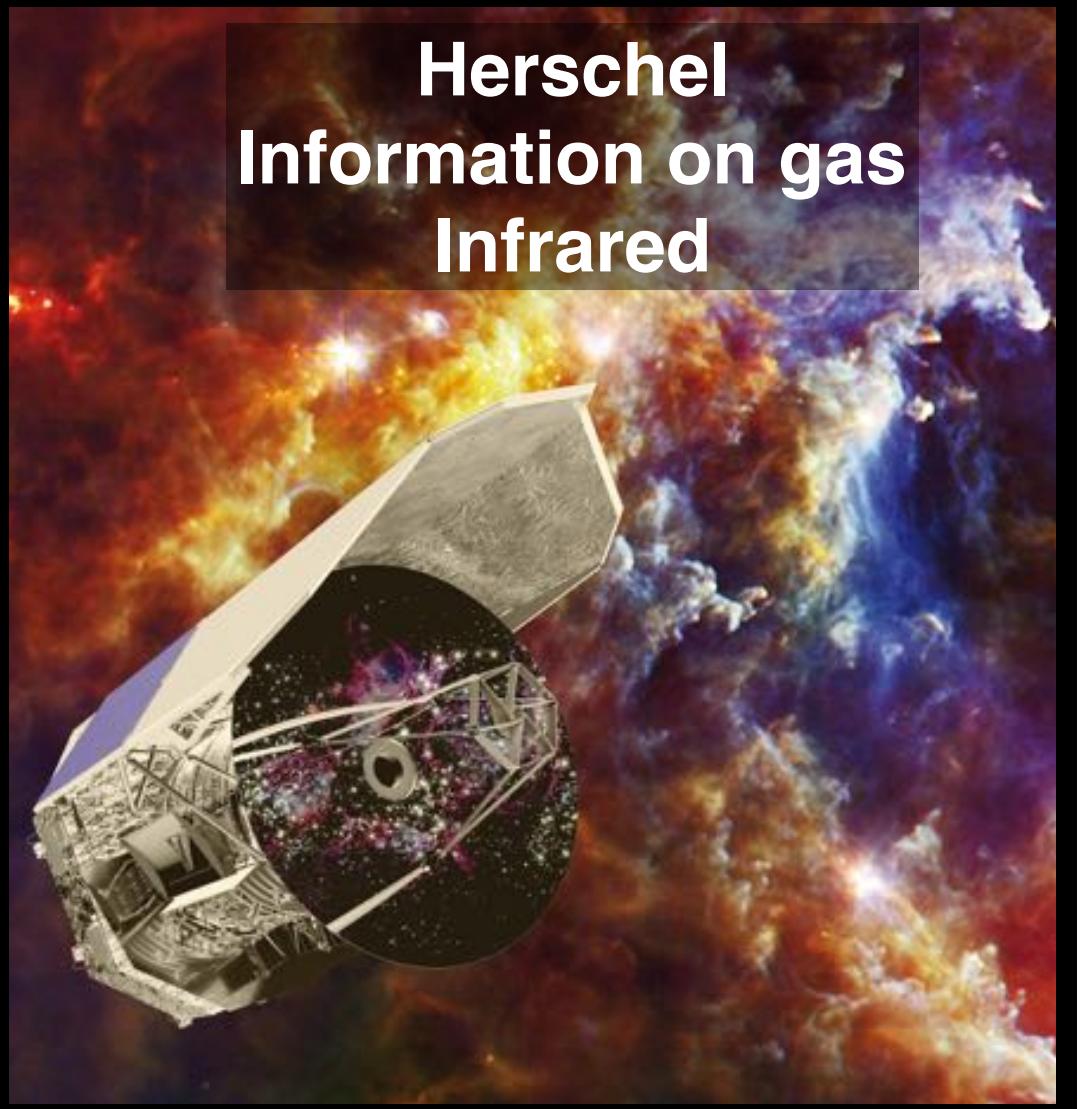




Gaia provides:
3D position and velocity, Mass, Age and Colours
of MilkyWay stars



Star Form Mapper



Massive star and star cluster formation

SFM

www.sfm.leeds.ac.uk