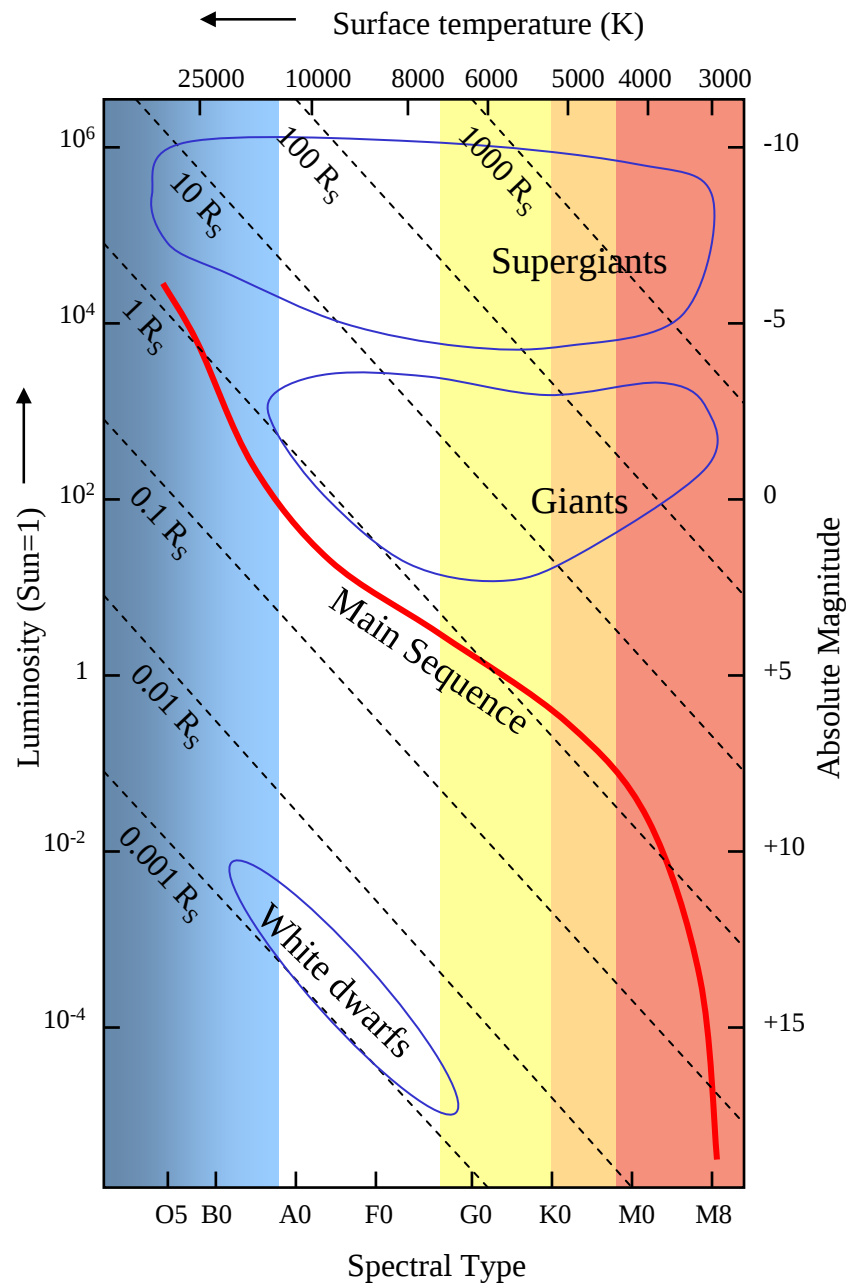


Hubble Vision

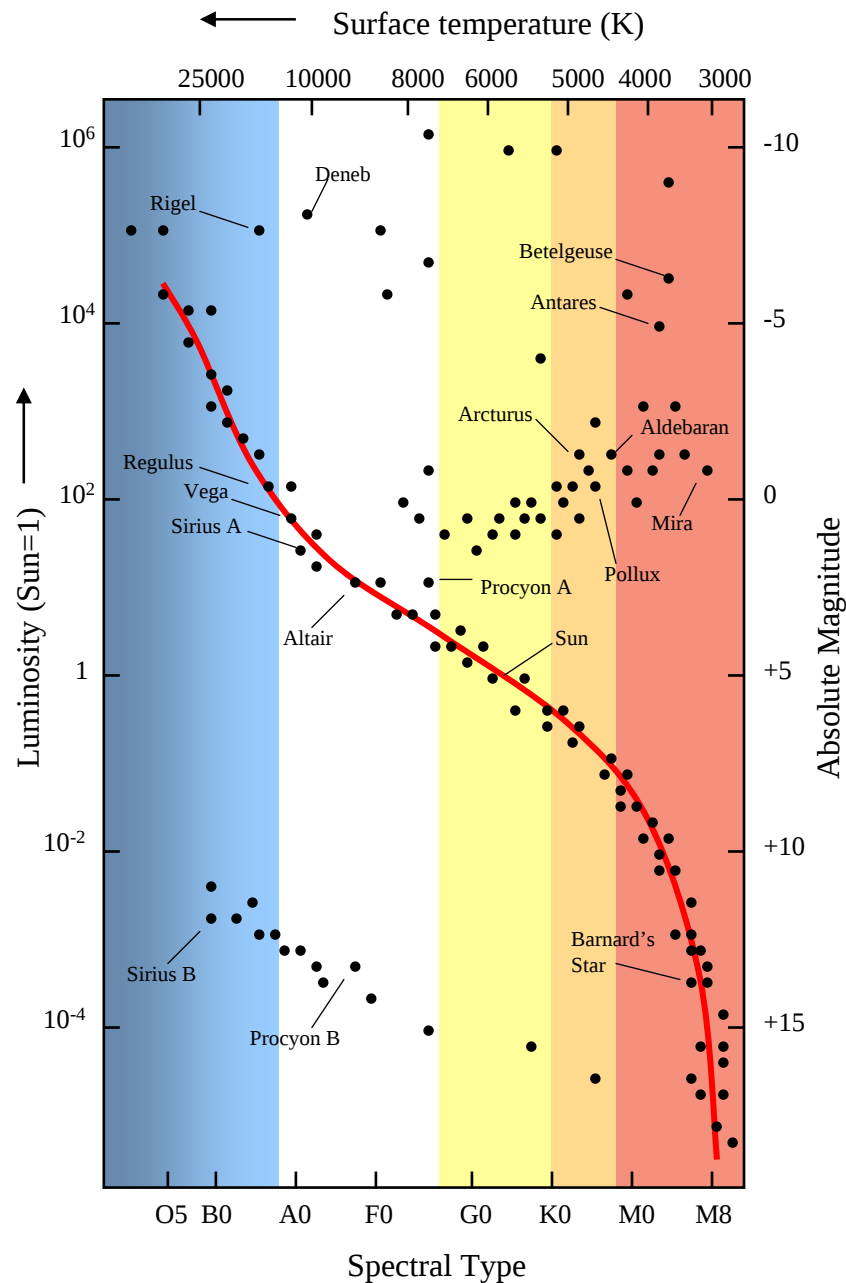
Dr Martin Hendry
Dept of Physics and Astronomy
University of Glasgow





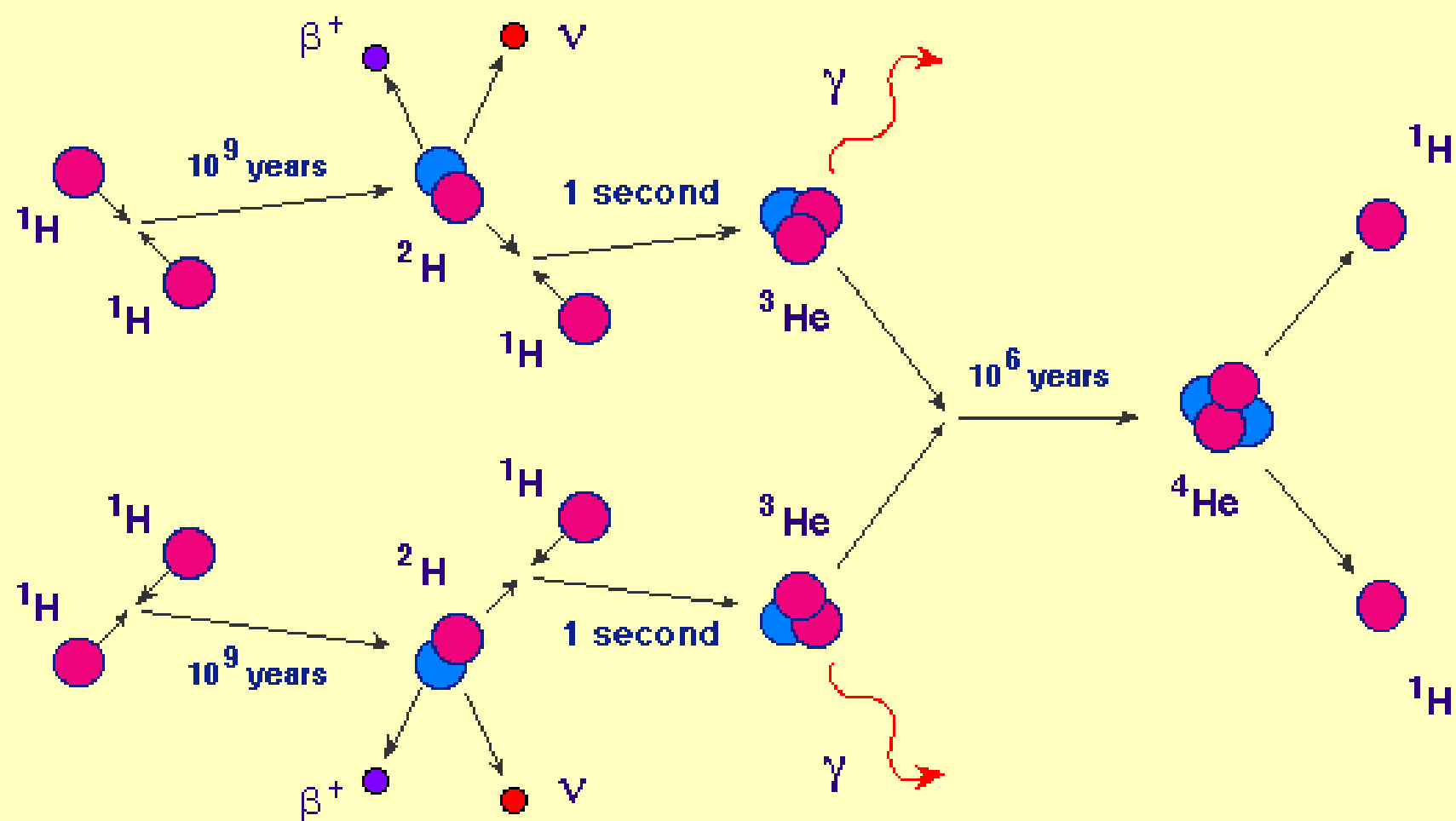
We can plot the **temperature** and **luminosity** of stars on a diagram

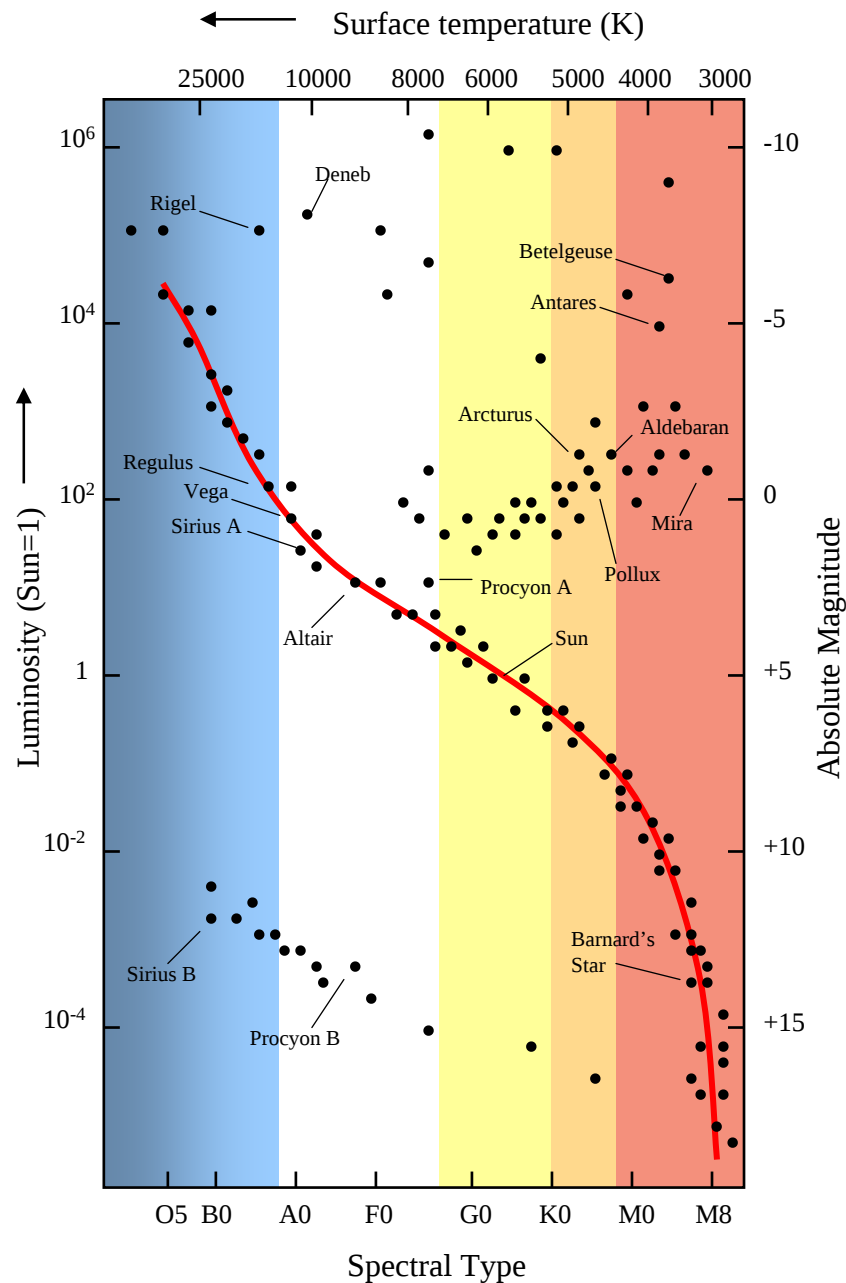
Stars don't appear *everywhere*: they group together, and most are found on the **Main Sequence**



Stars on the
Main Sequence
convert hydrogen
into helium.

Stars like the Sun
can do this for
many billions of
years, using the
P-P chain of
nuclear reactions



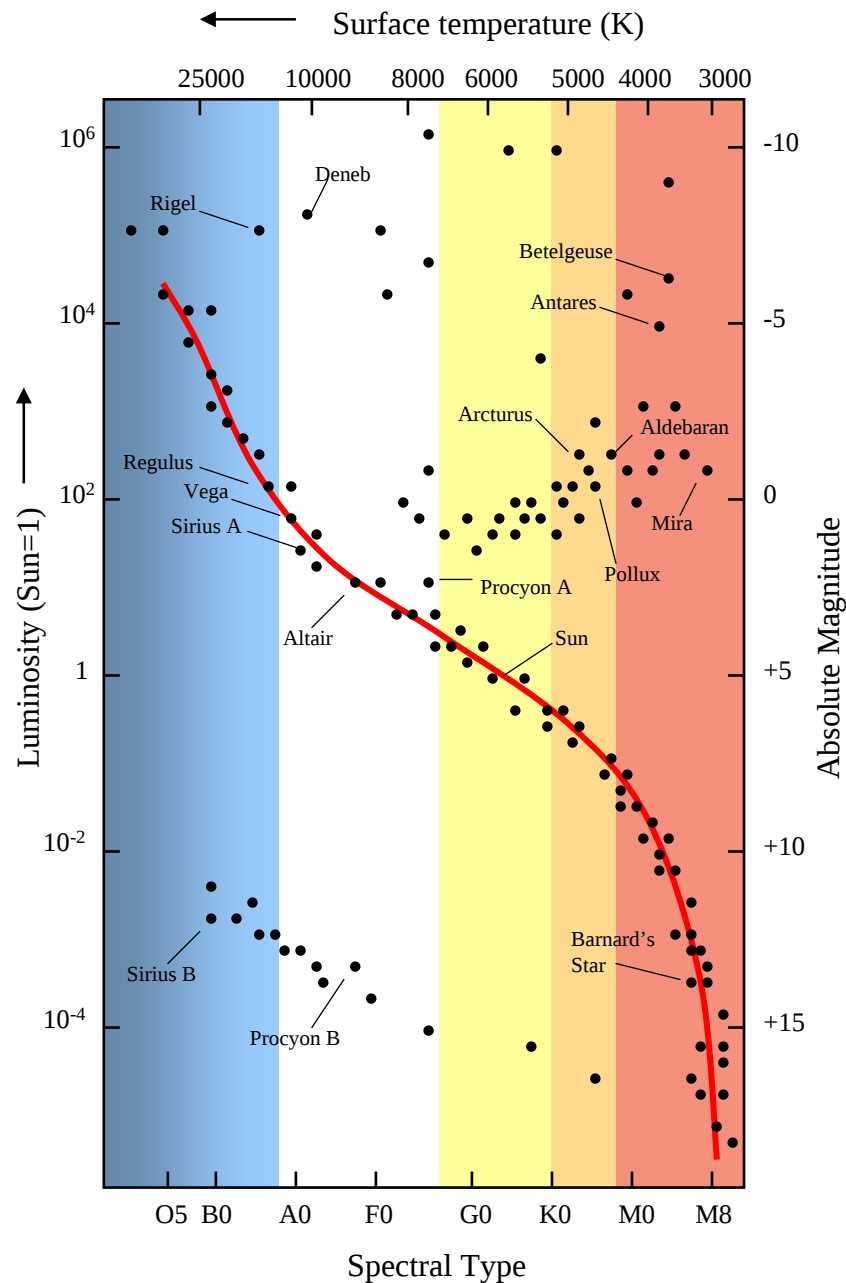


Stars on the
Main Sequence
turn hydrogen
into helium.

Blue stars are
much hotter
than the Sun,
and use up their
hydrogen in a
few million years

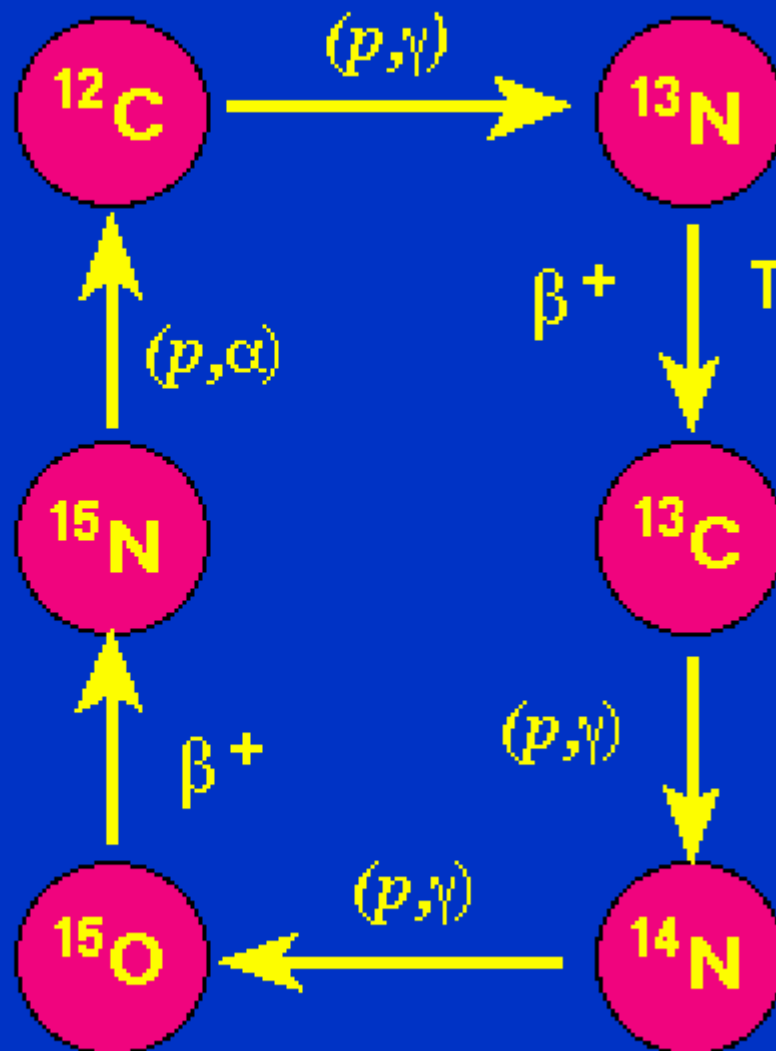
© Mark A. Garlick
space-art.co.uk





Stars on the
Main Sequence
convert hydrogen
into helium.

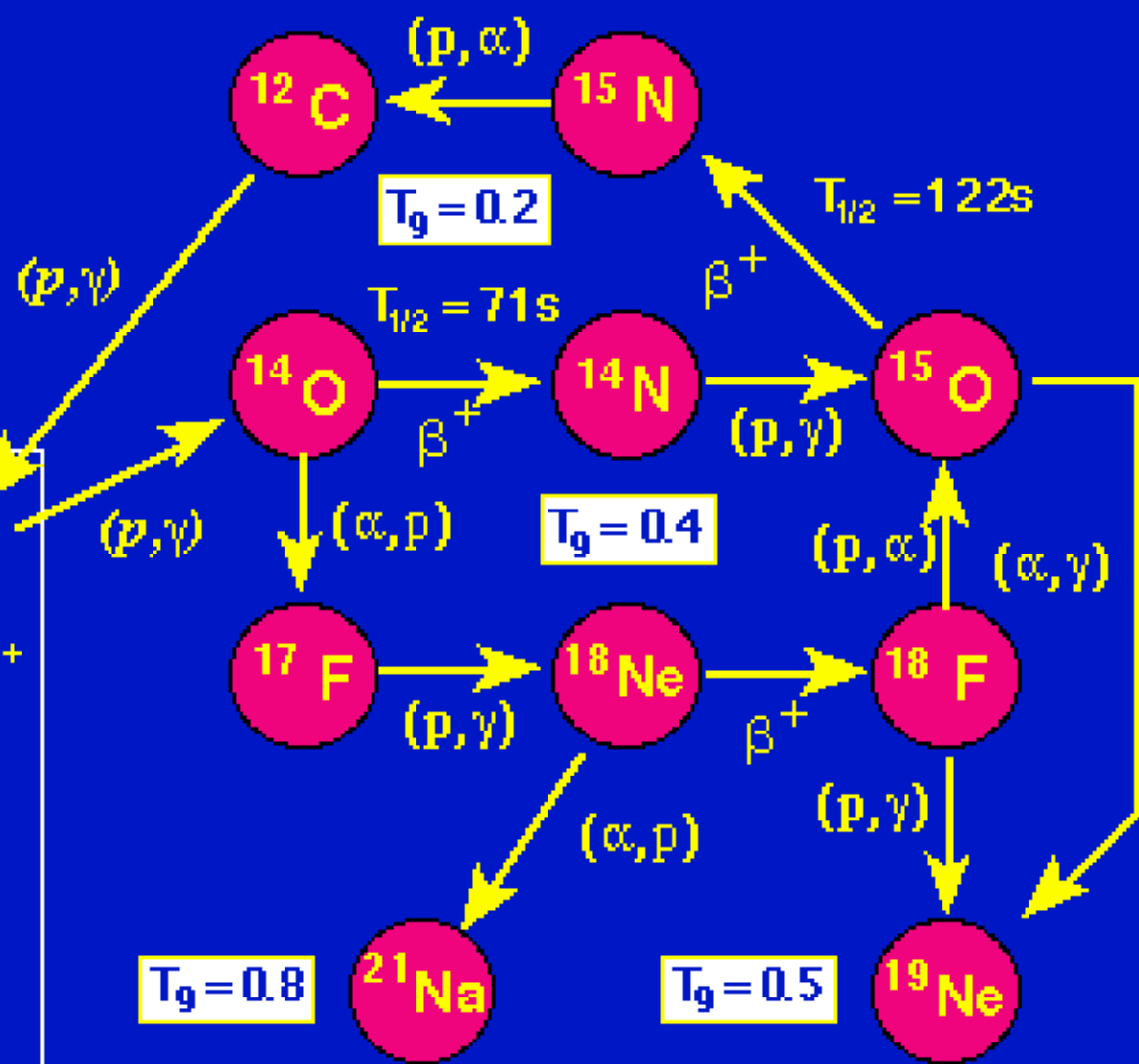
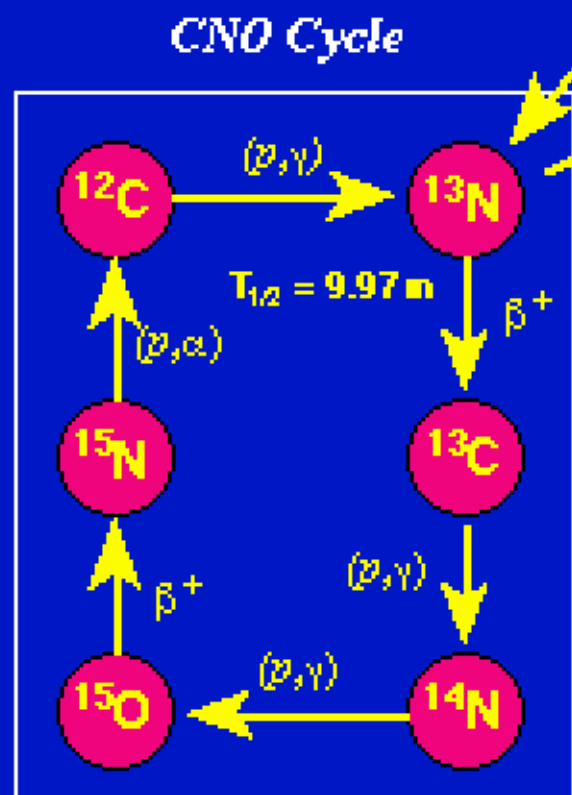
These hotter
stars burn their
hydrogen much
faster, via the
CNO Cycle



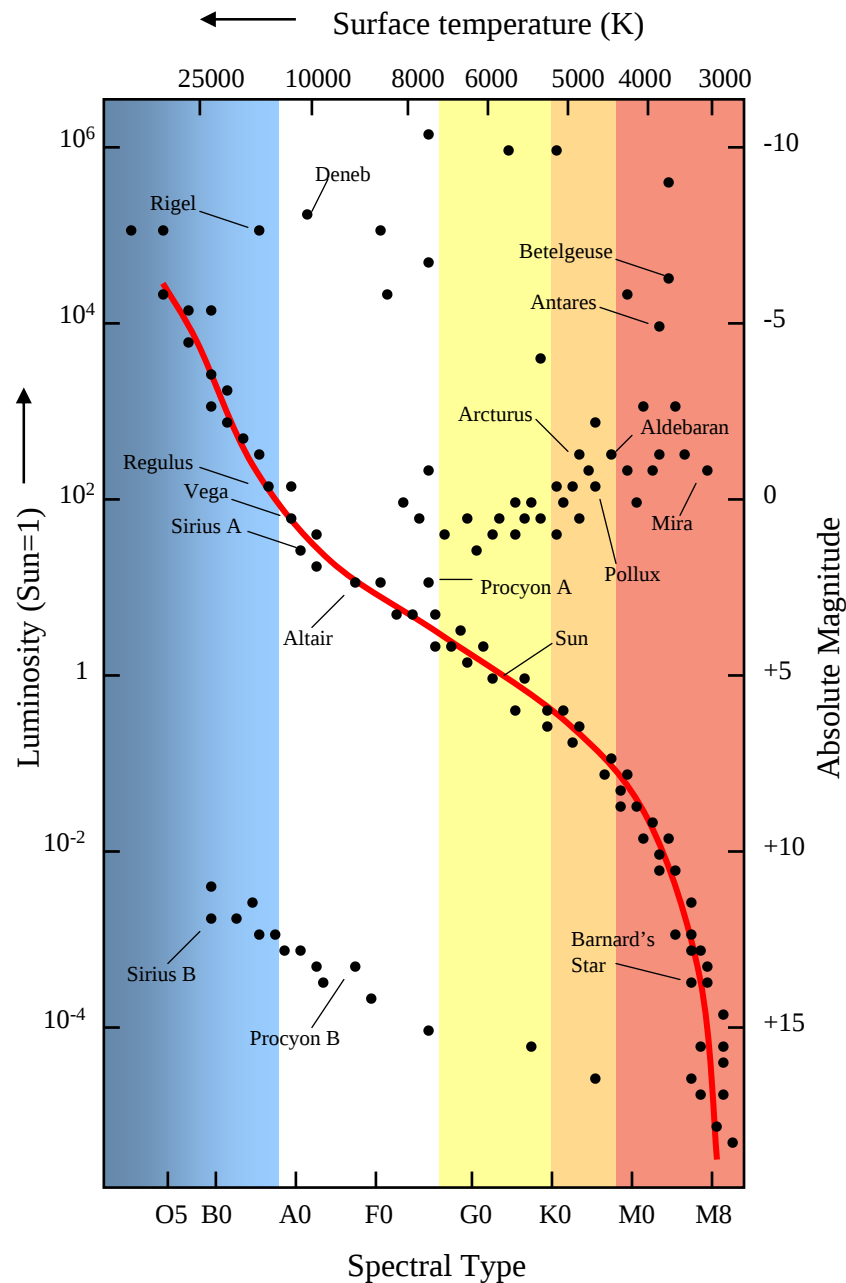
The CNO Cycle

$T > 1.6 \times 10^7 \text{ K}$
 $M > 1.1 \text{ Solar Masses}$

The Hot CNO Cycle

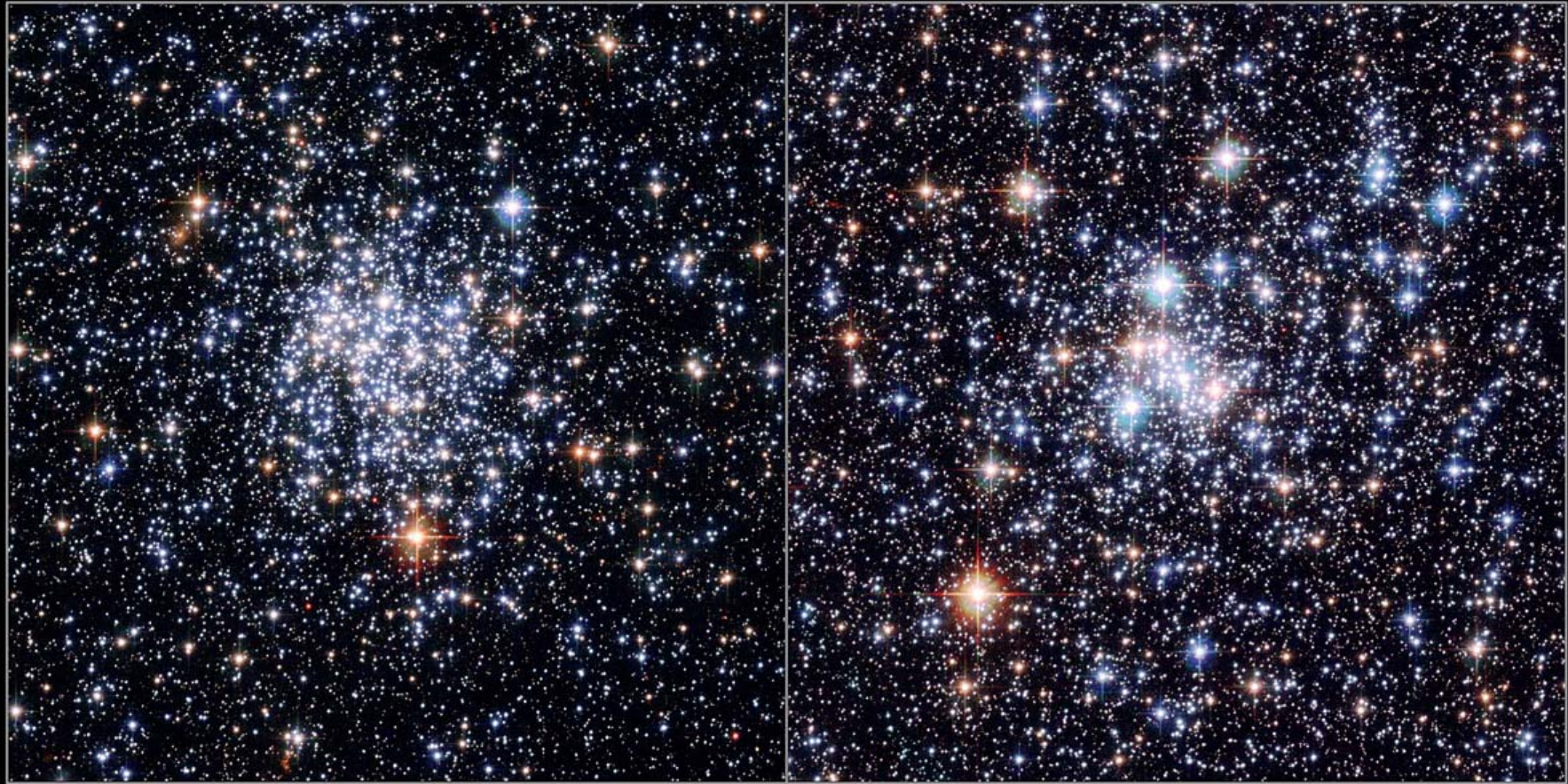


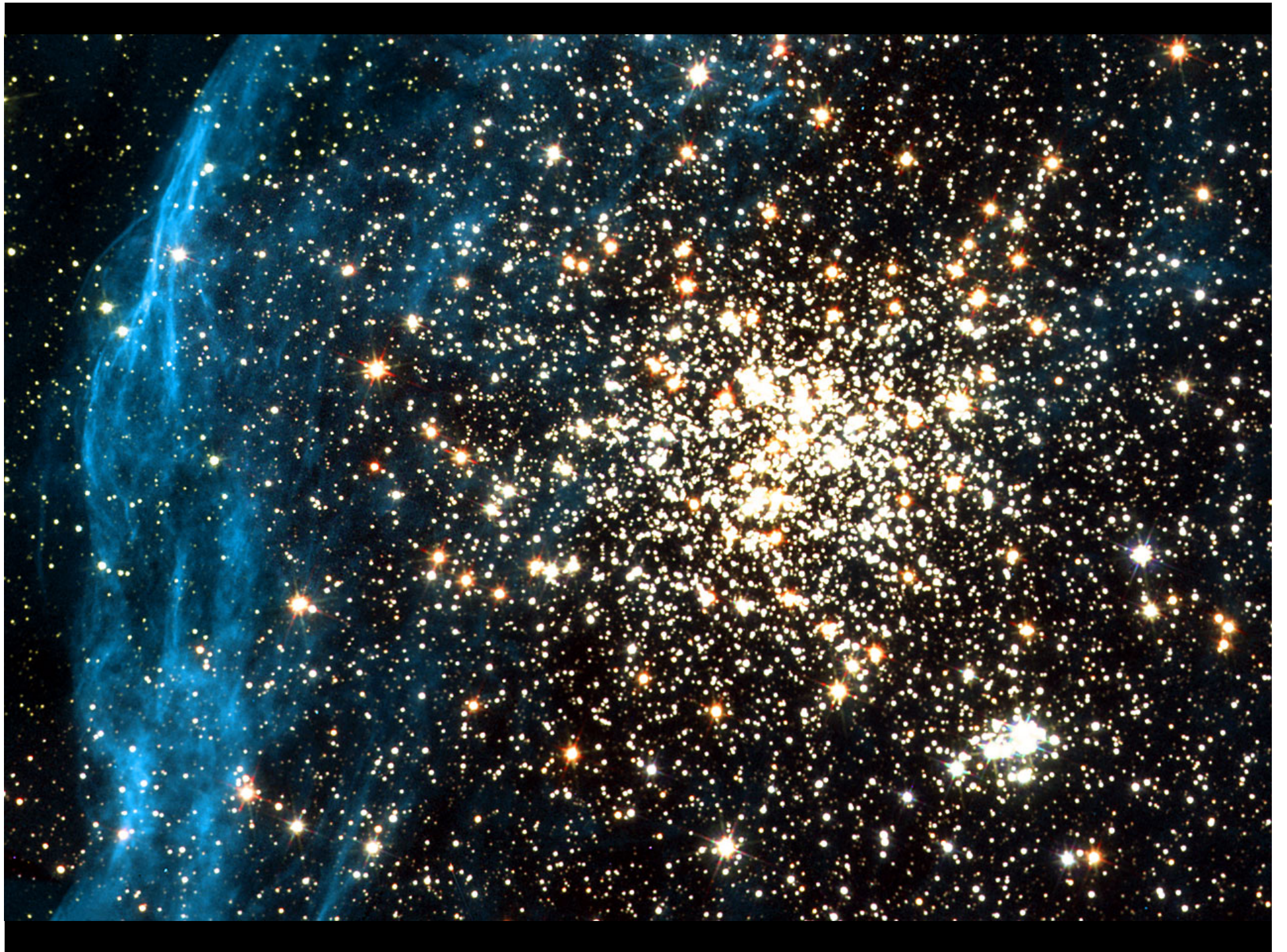
Seeds for rp Process



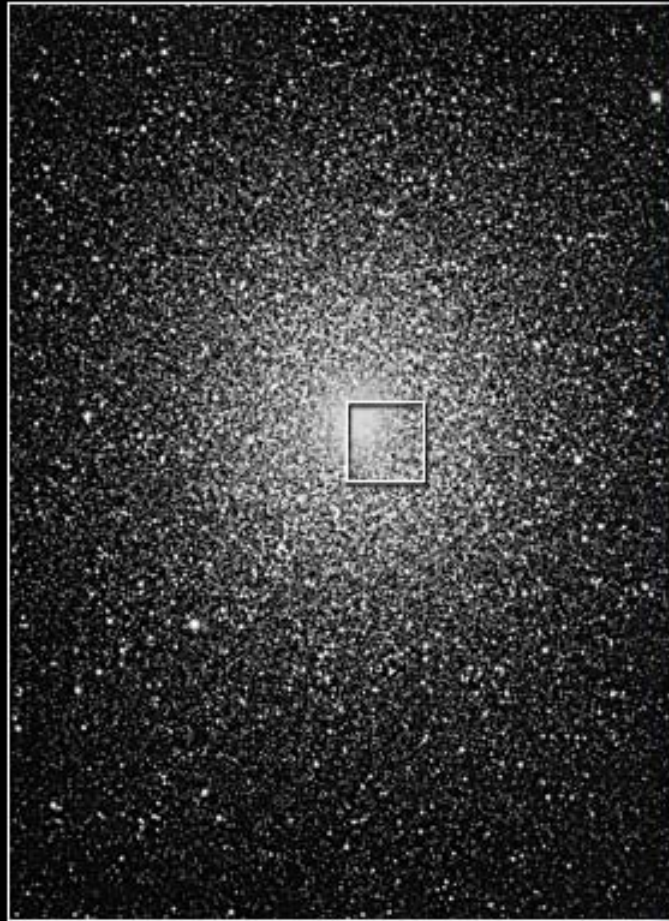
Stars on the
Main Sequence
convert hydrogen
into helium.

Stars like the Sun
can do this for
many billions of
years, using the
P-P chain of
nuclear reactions





Globular Cluster 47 Tucanae



Ground • AAT

NASA and R. Gilliland (STScI)
STScI-PRC00-33

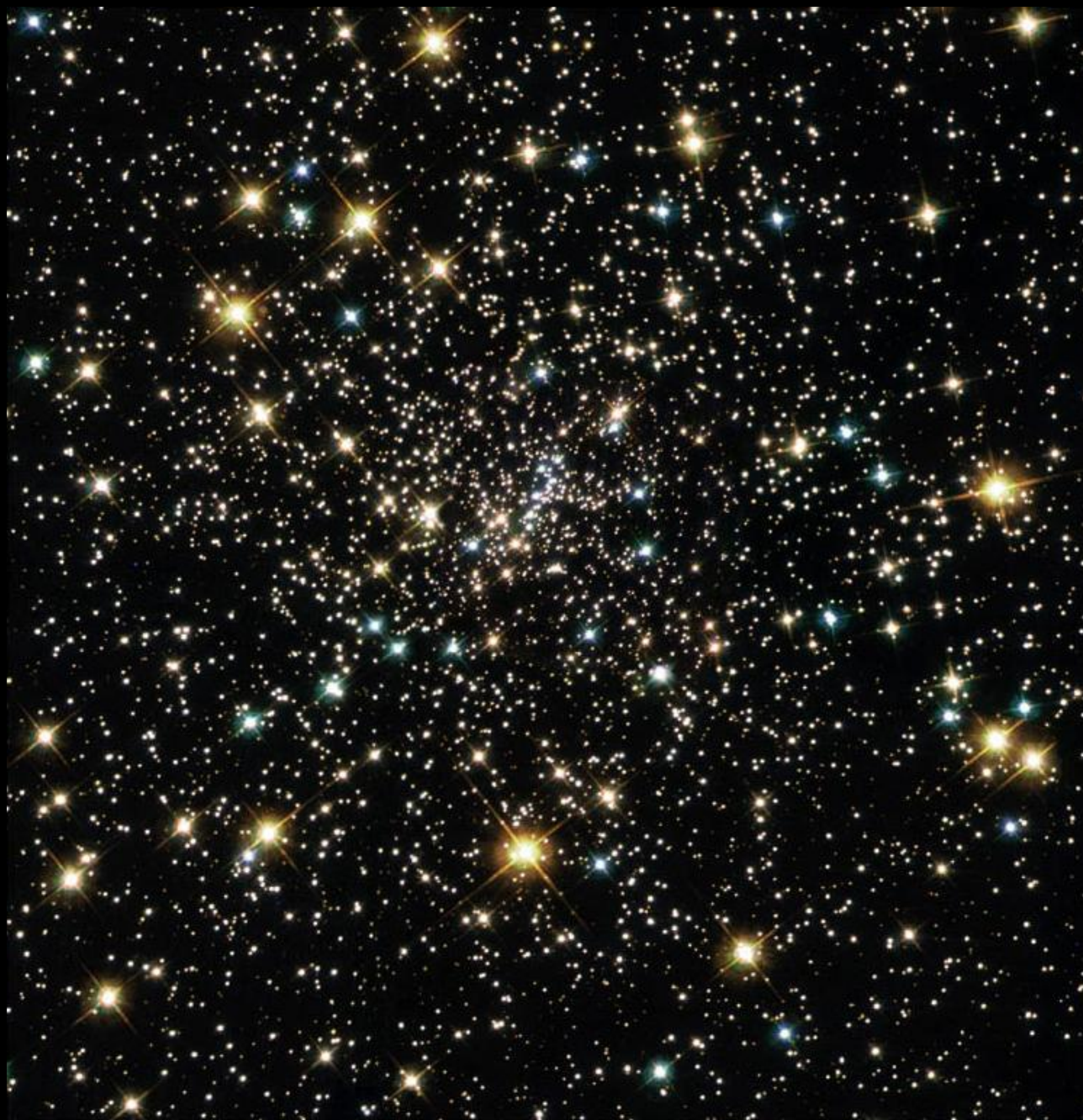


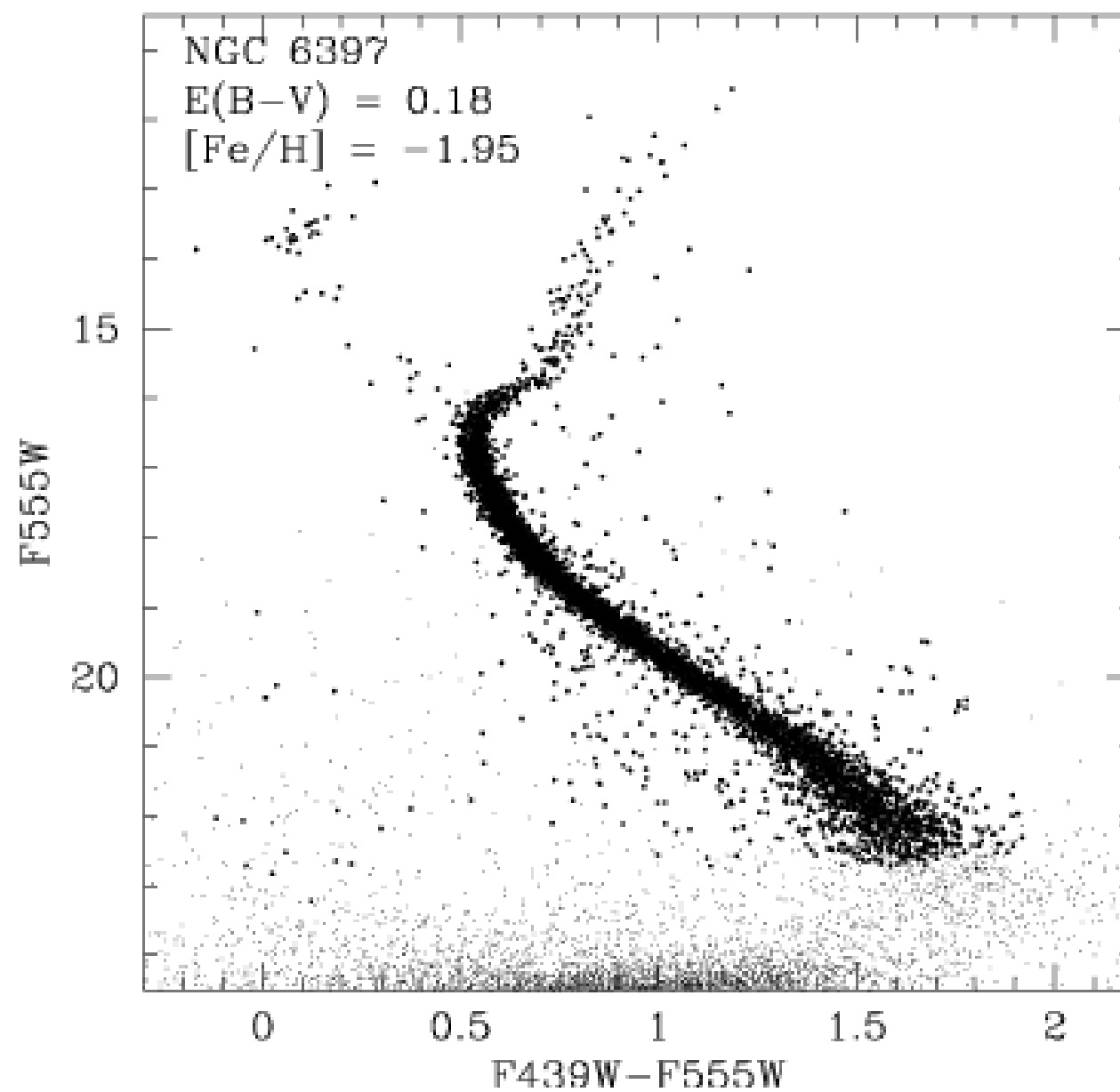
Hubble Space Telescope • WFPC2

Globular Cluster NGC 6093

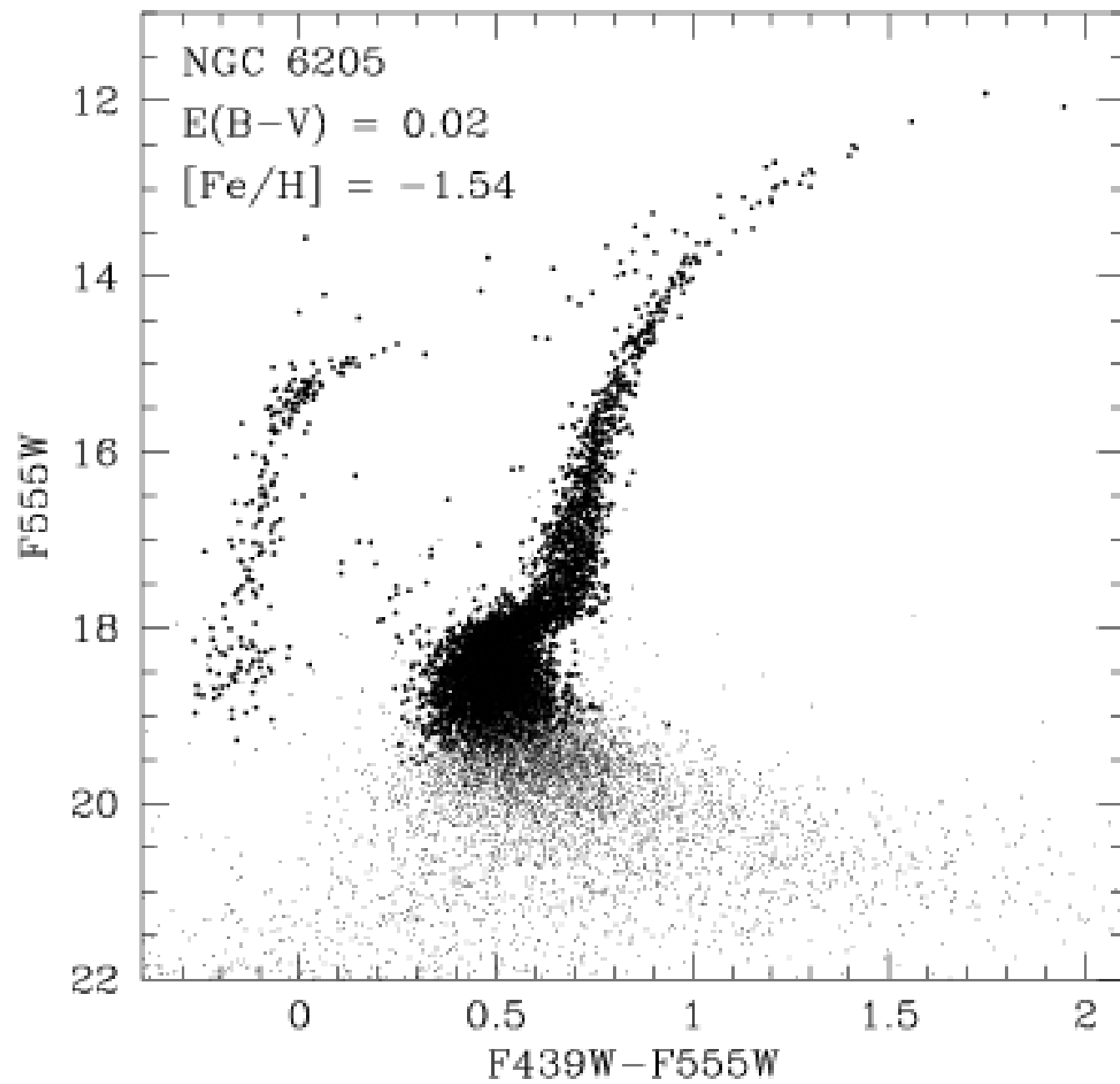


Hubble
Heritage

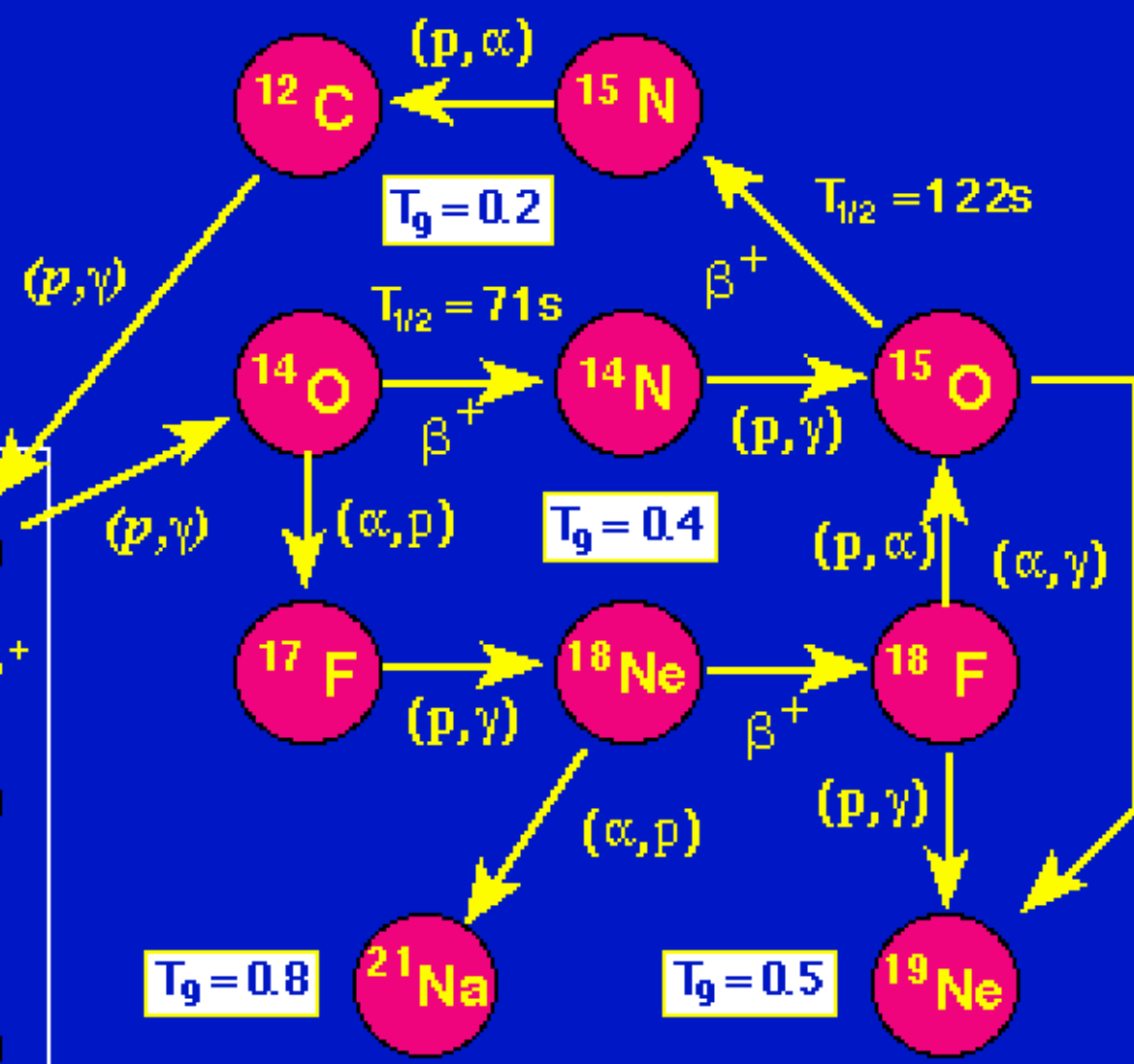
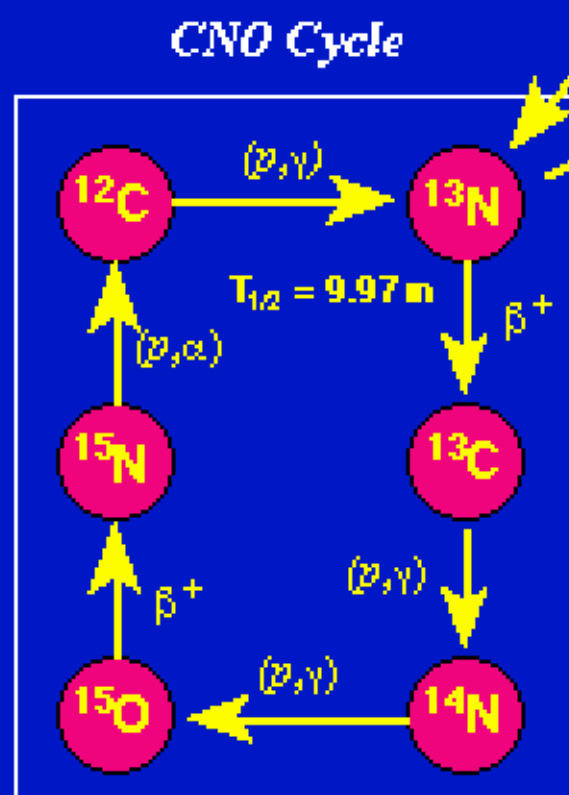






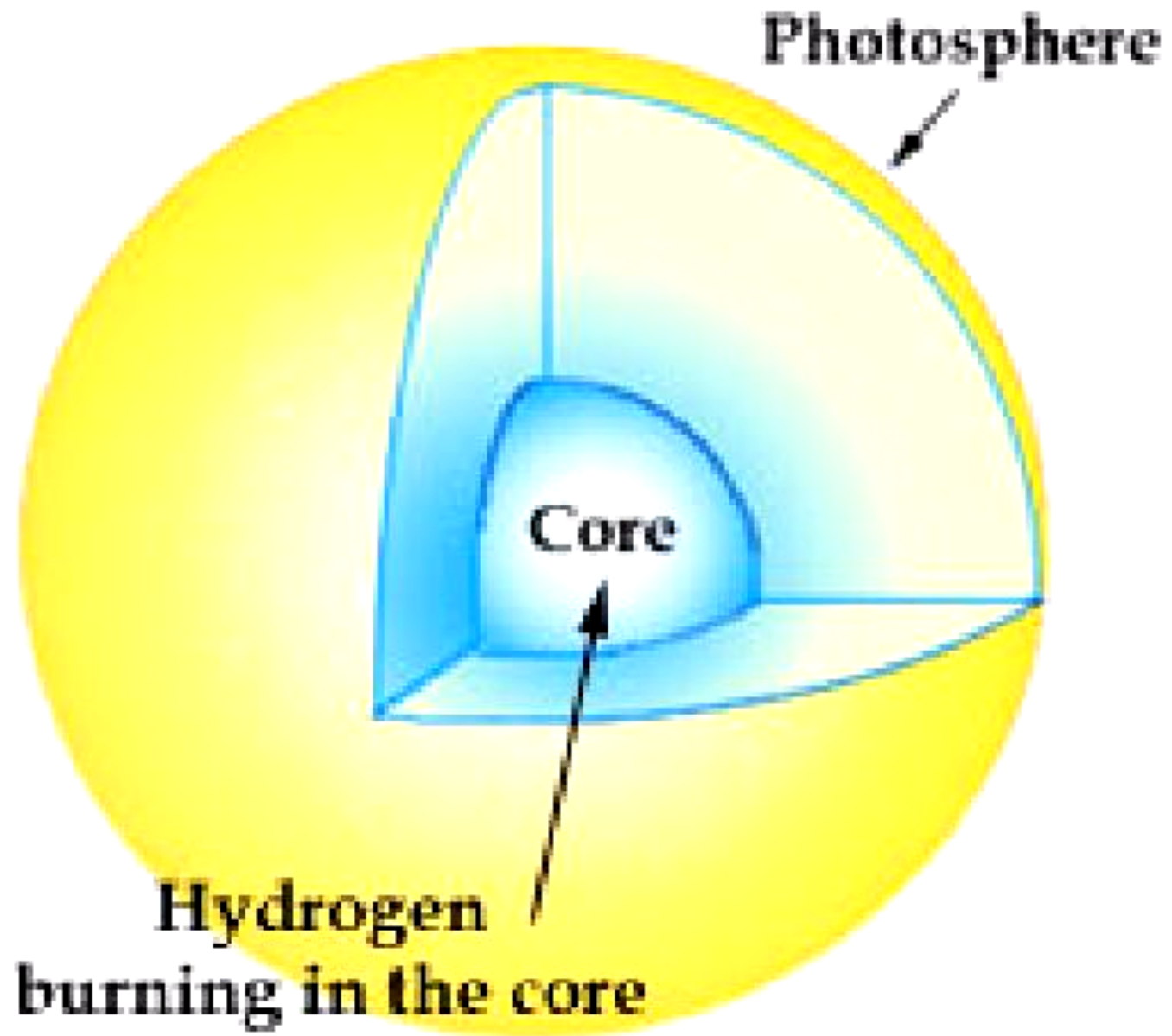


The Hot CNO Cycle

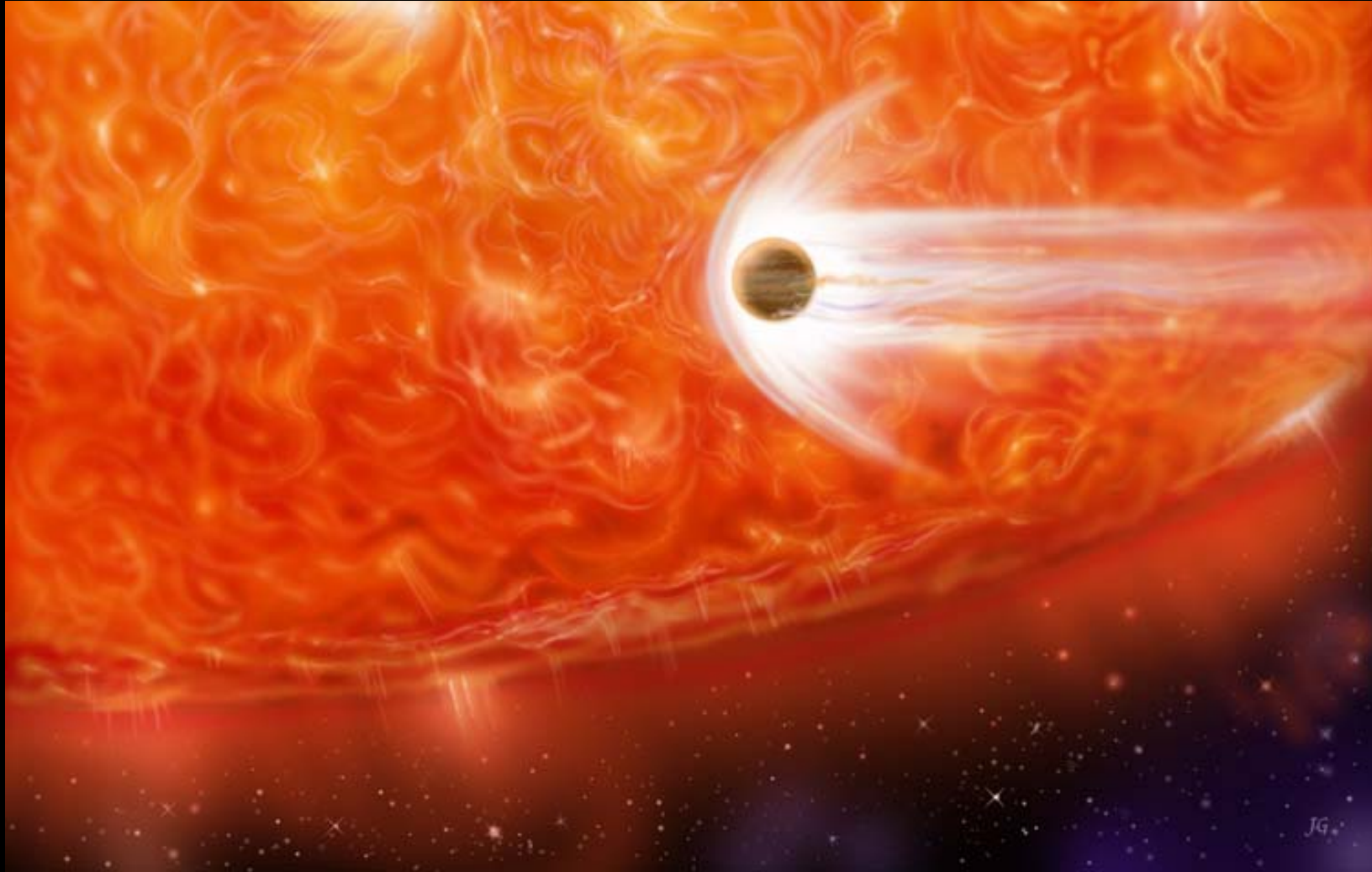


Seeds for rp Process

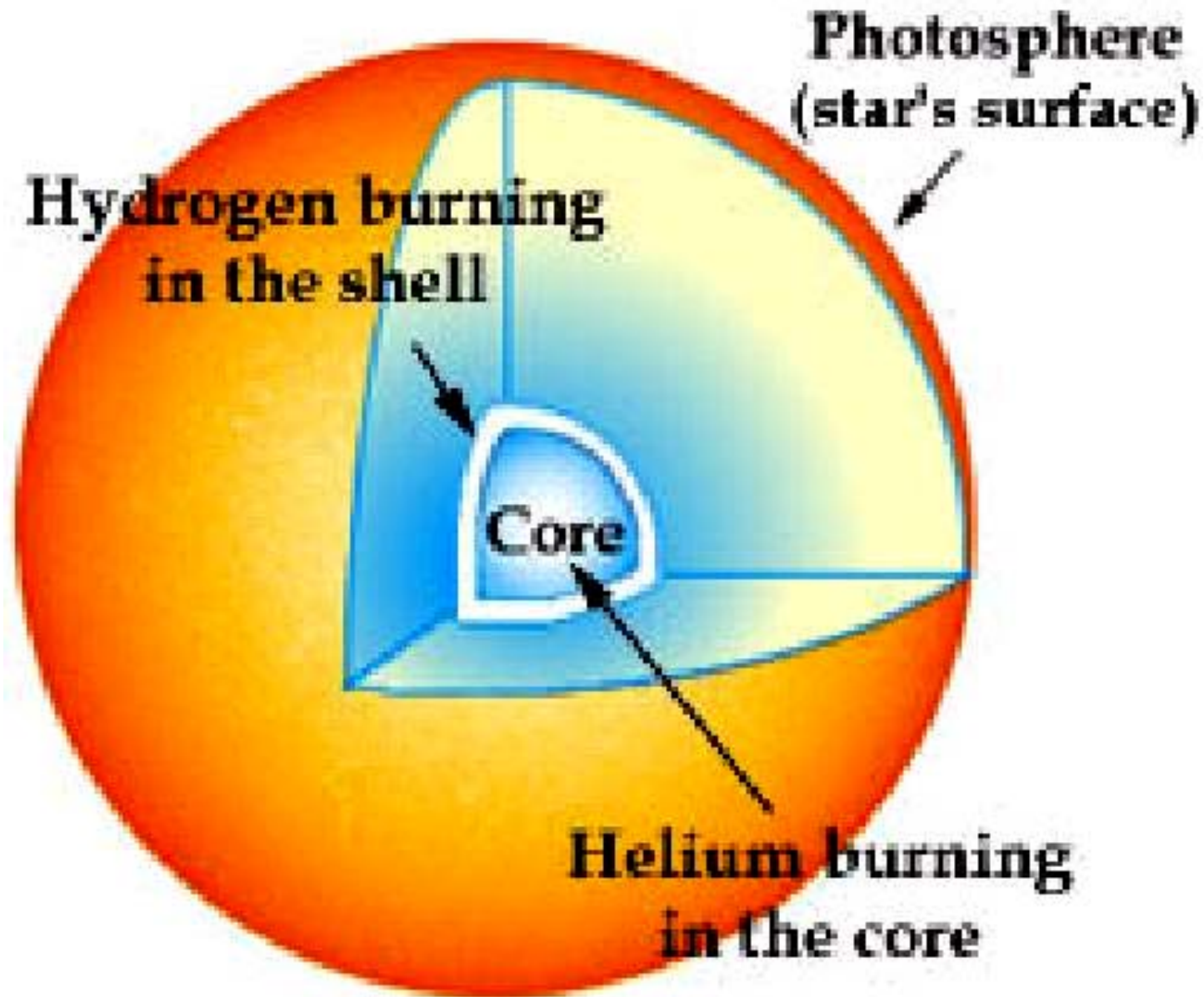
Interior of a solar-type star



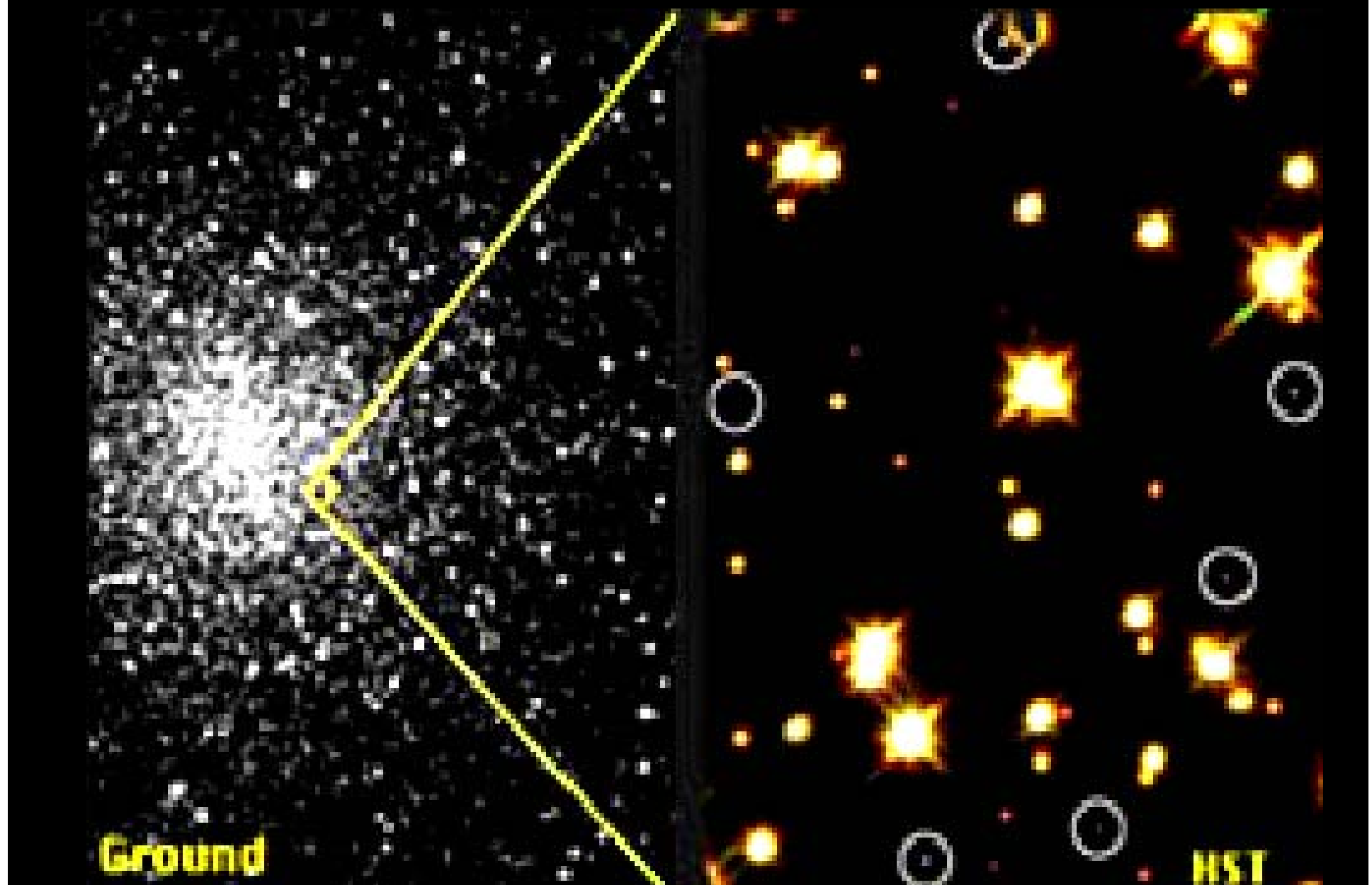
When the fuel runs out: formation of a red giant



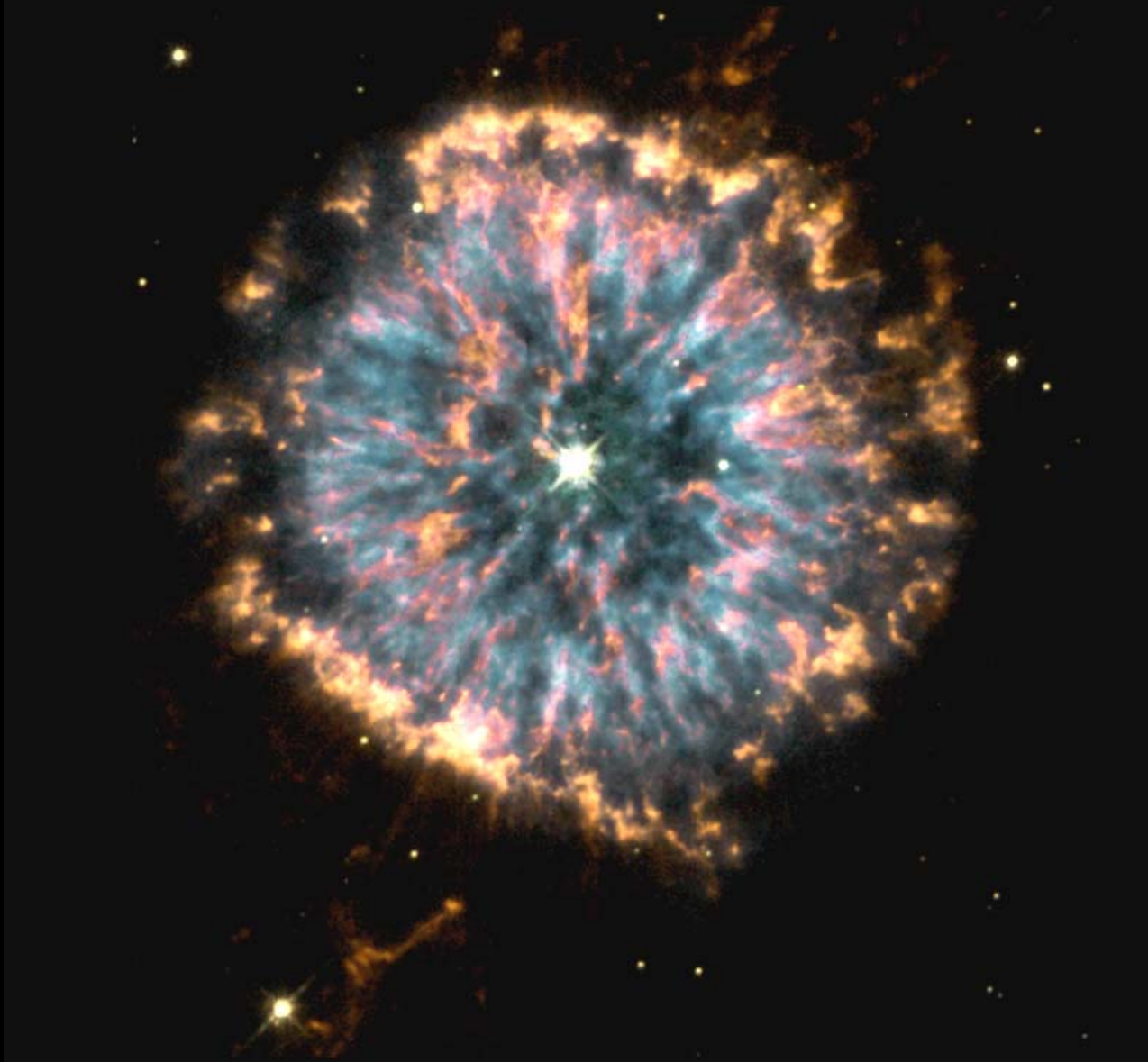
Interior of a red giant star



White dwarfs: earth-sized stellar relics



Planetary Nebula NGC 6751





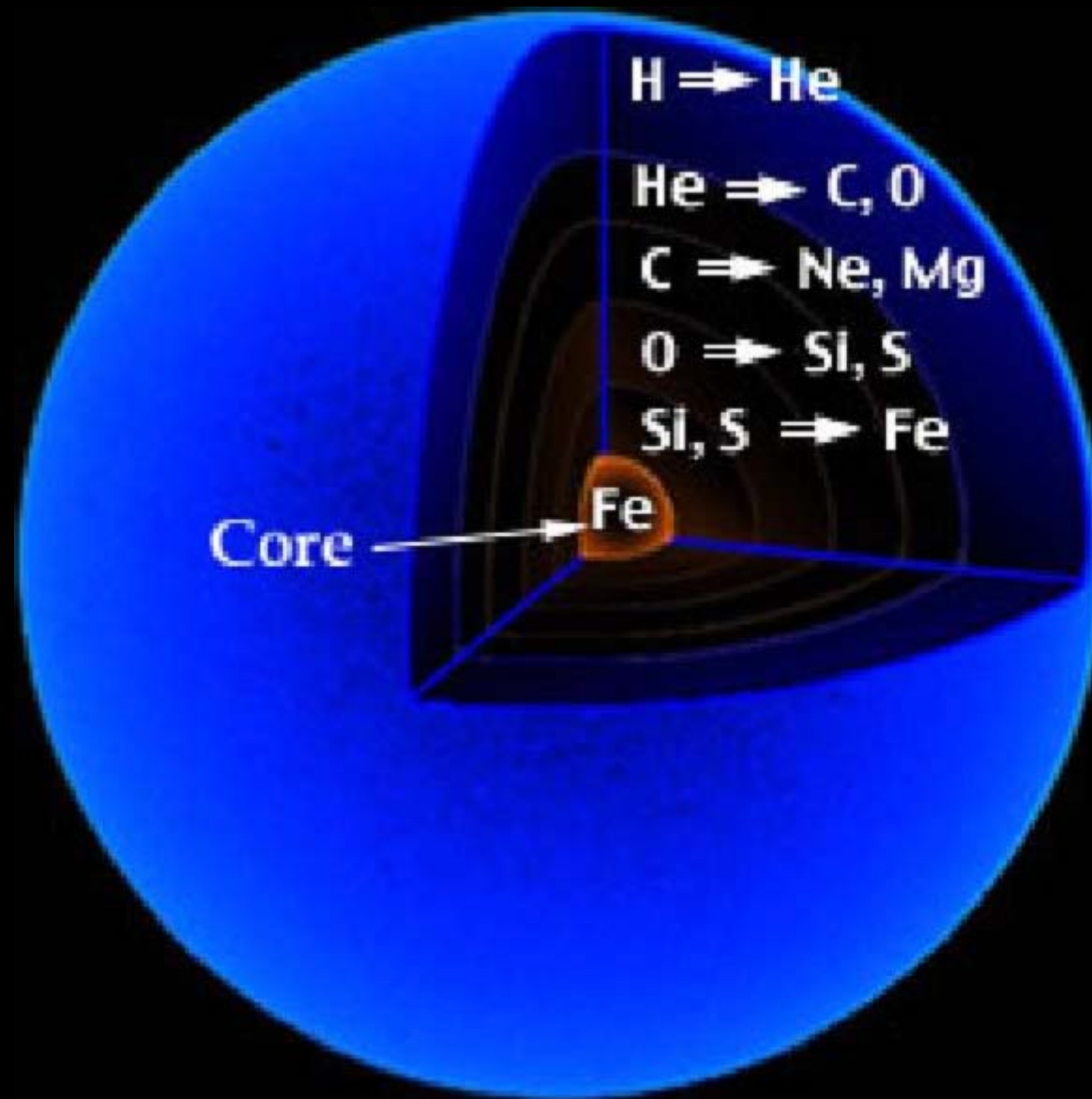


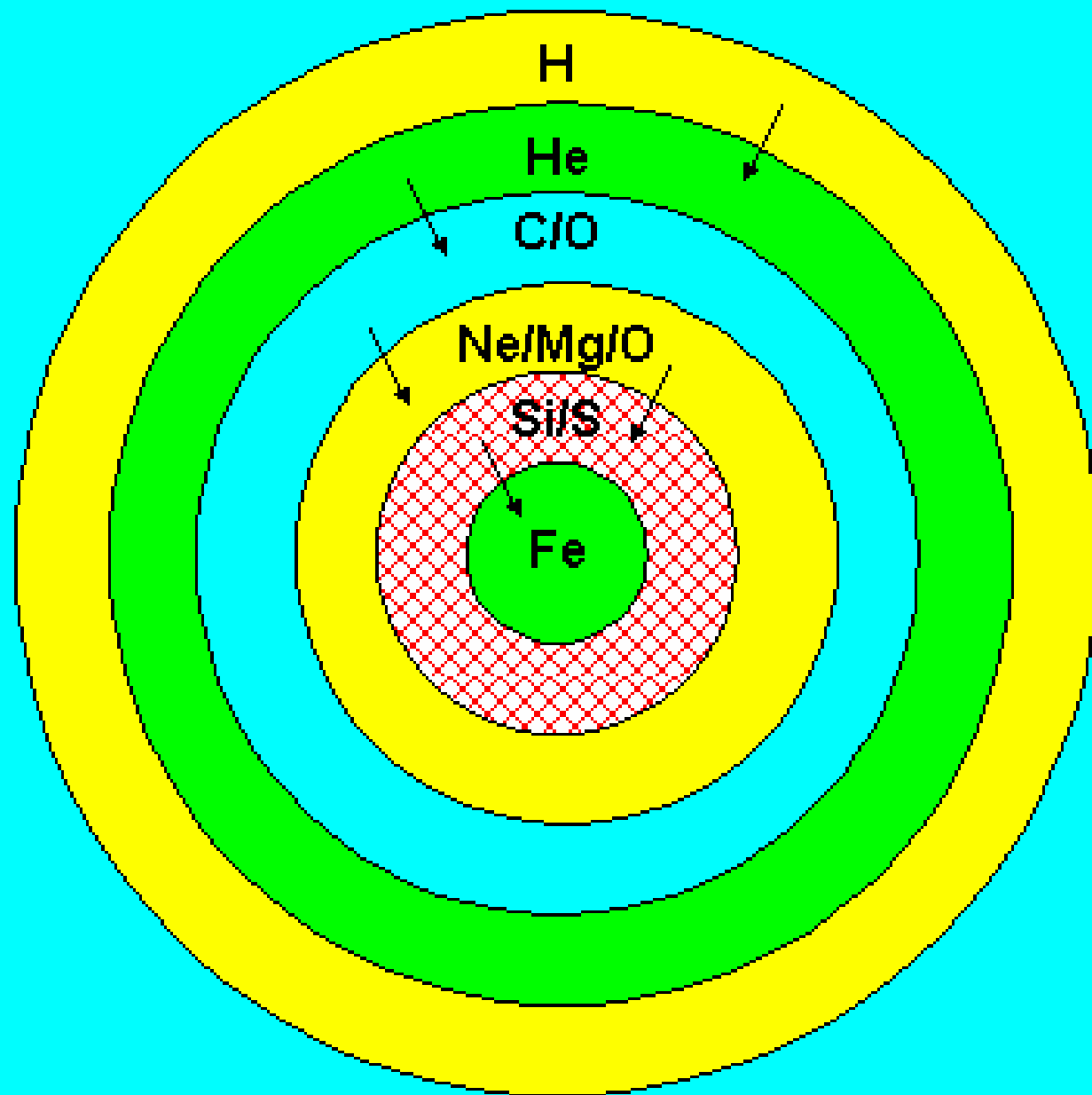


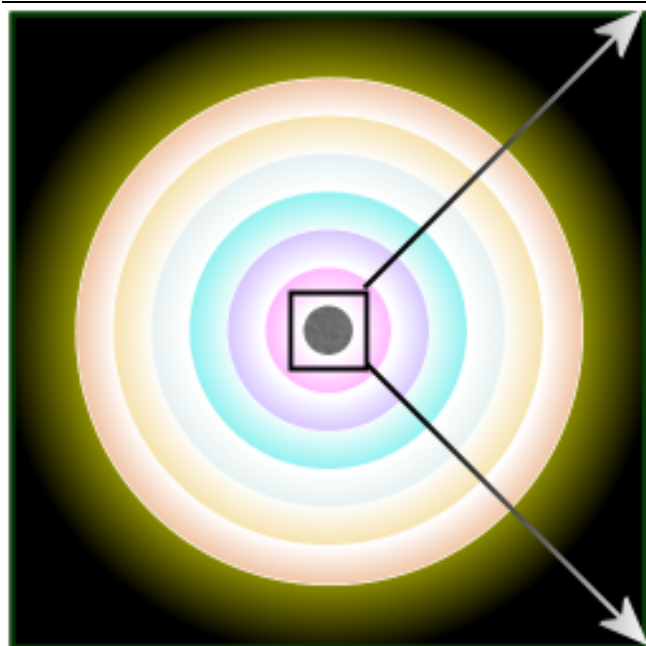
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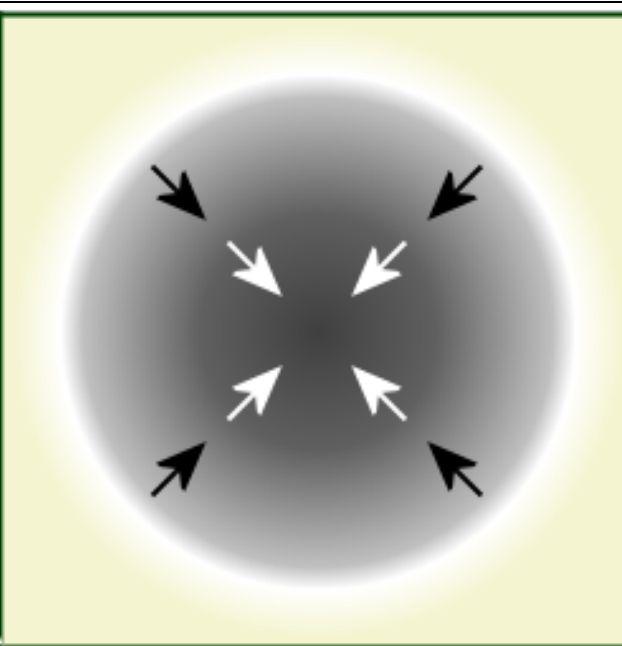
Interior of a very massive star



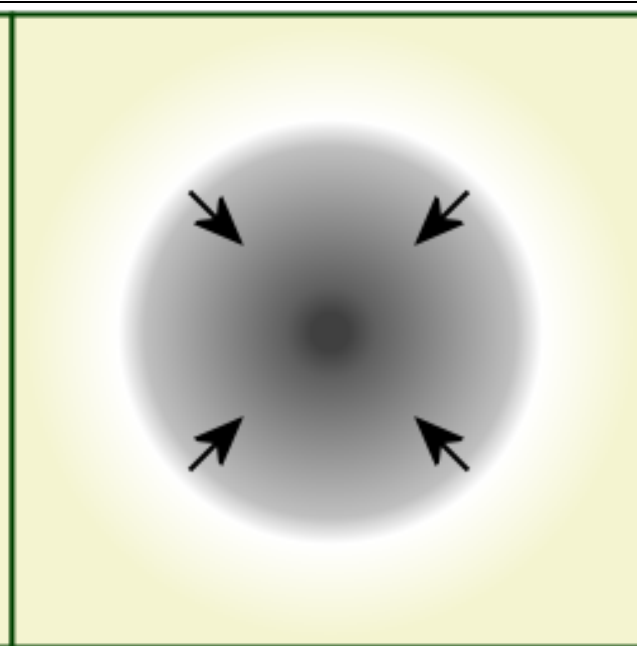




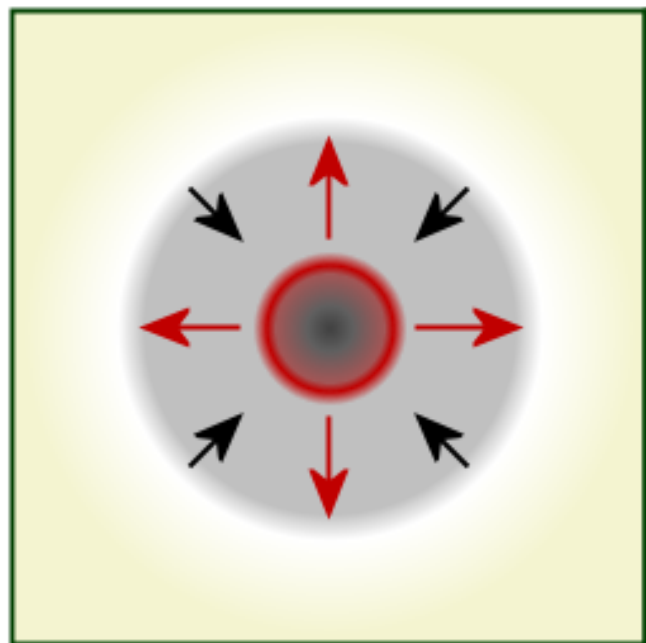
a



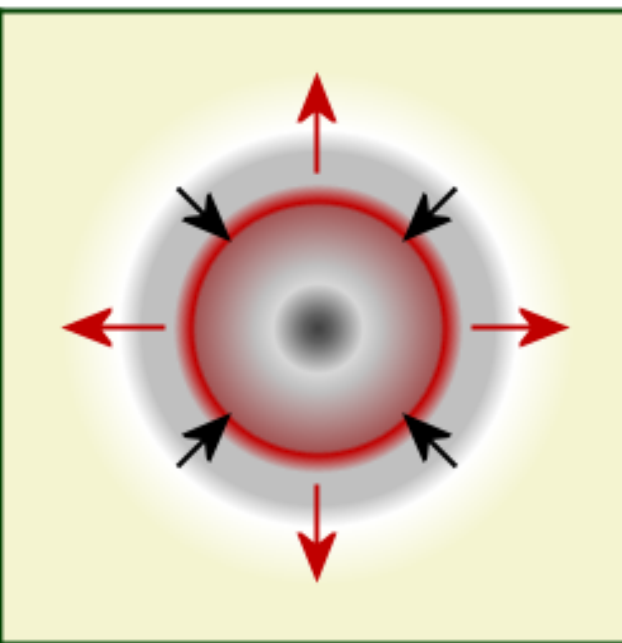
b



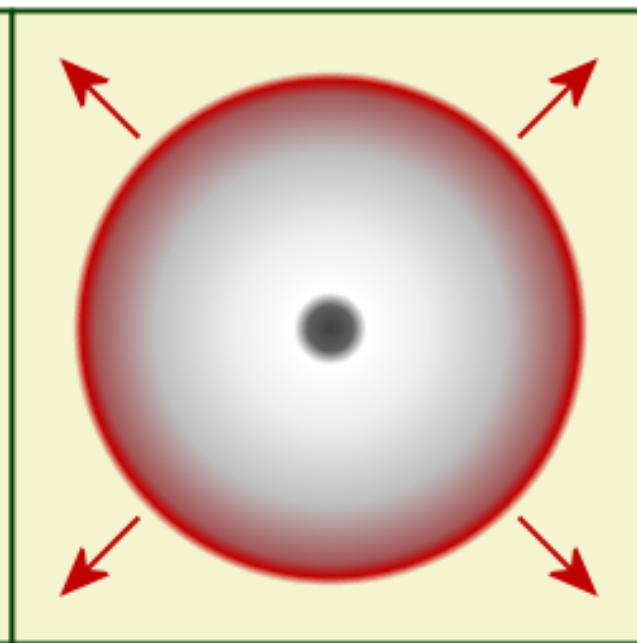
c



d



e



f



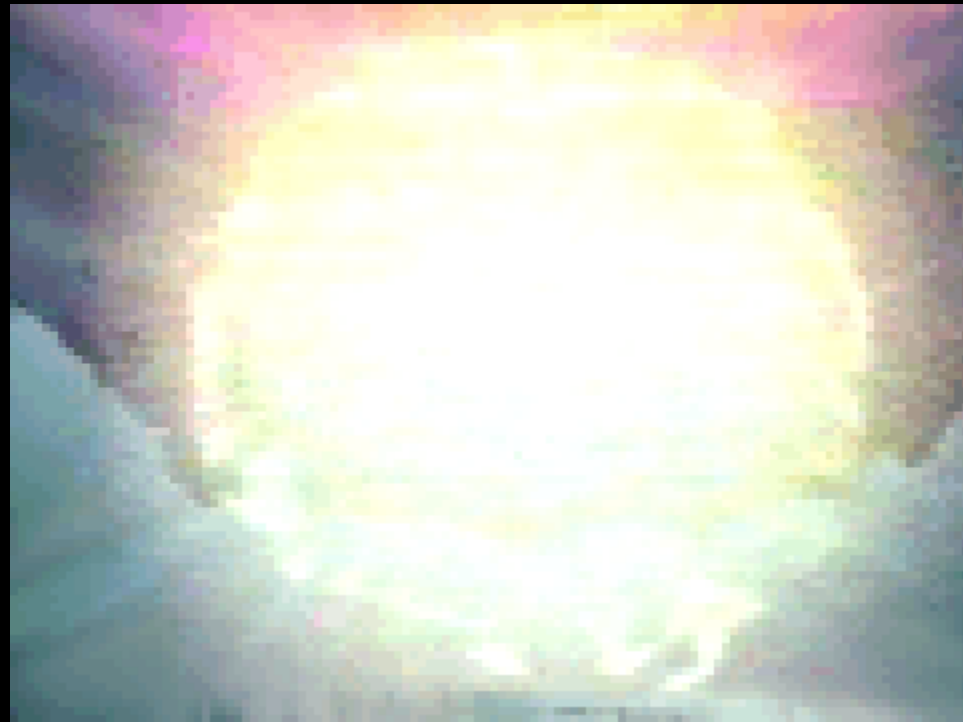






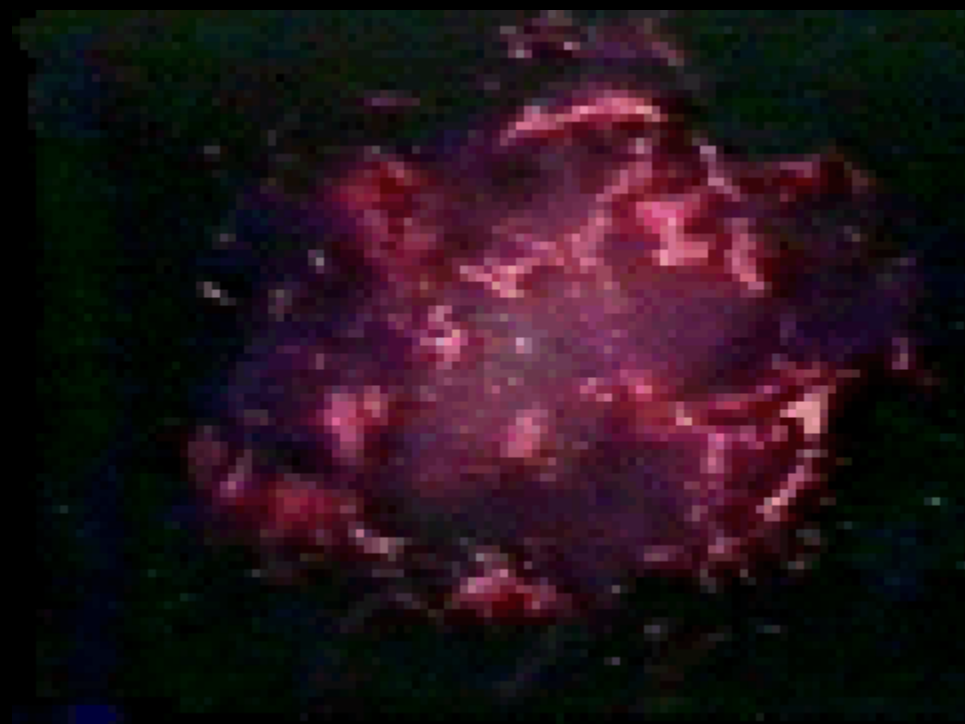






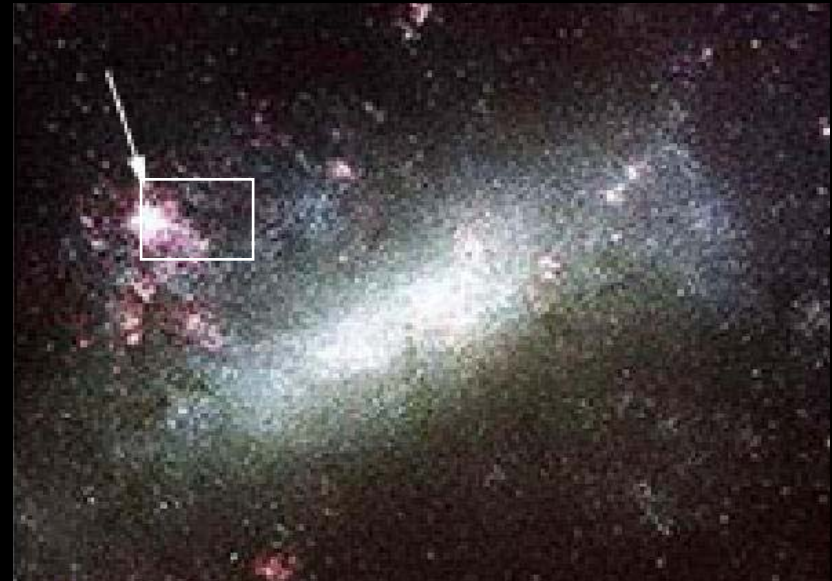


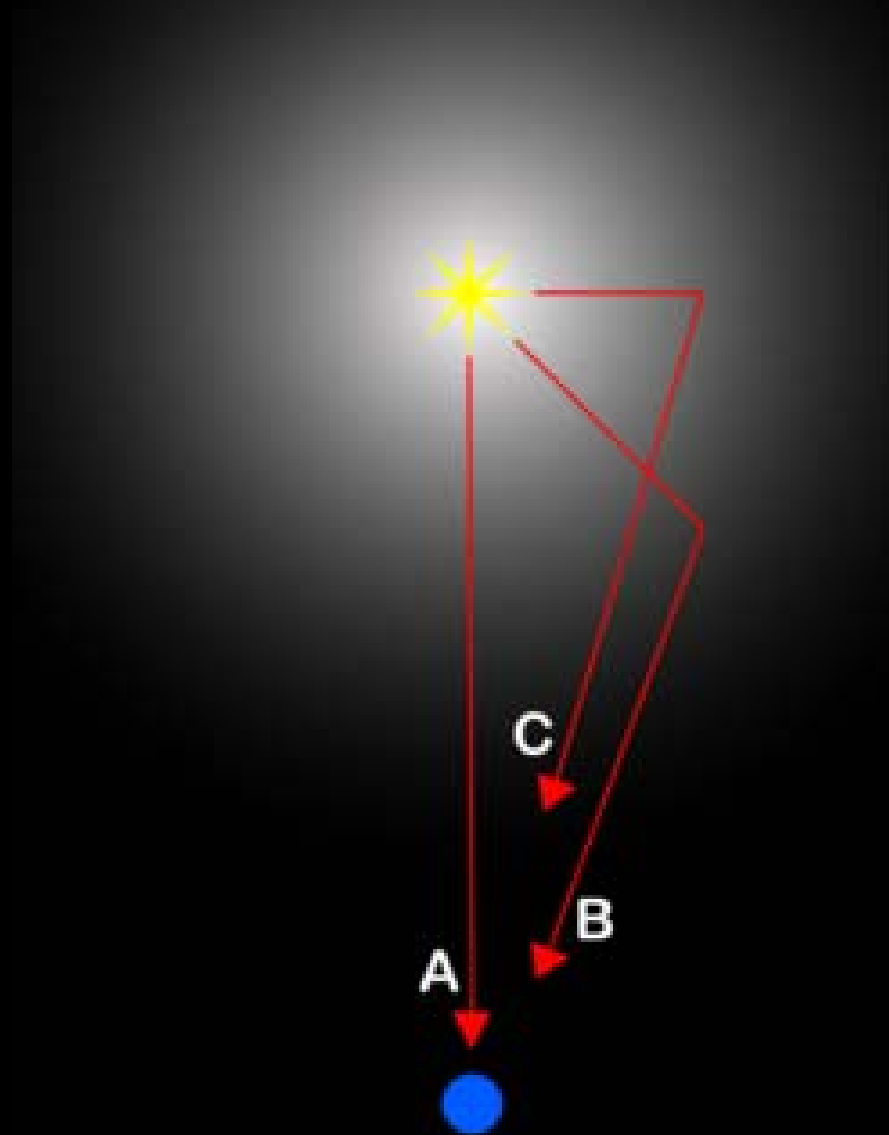


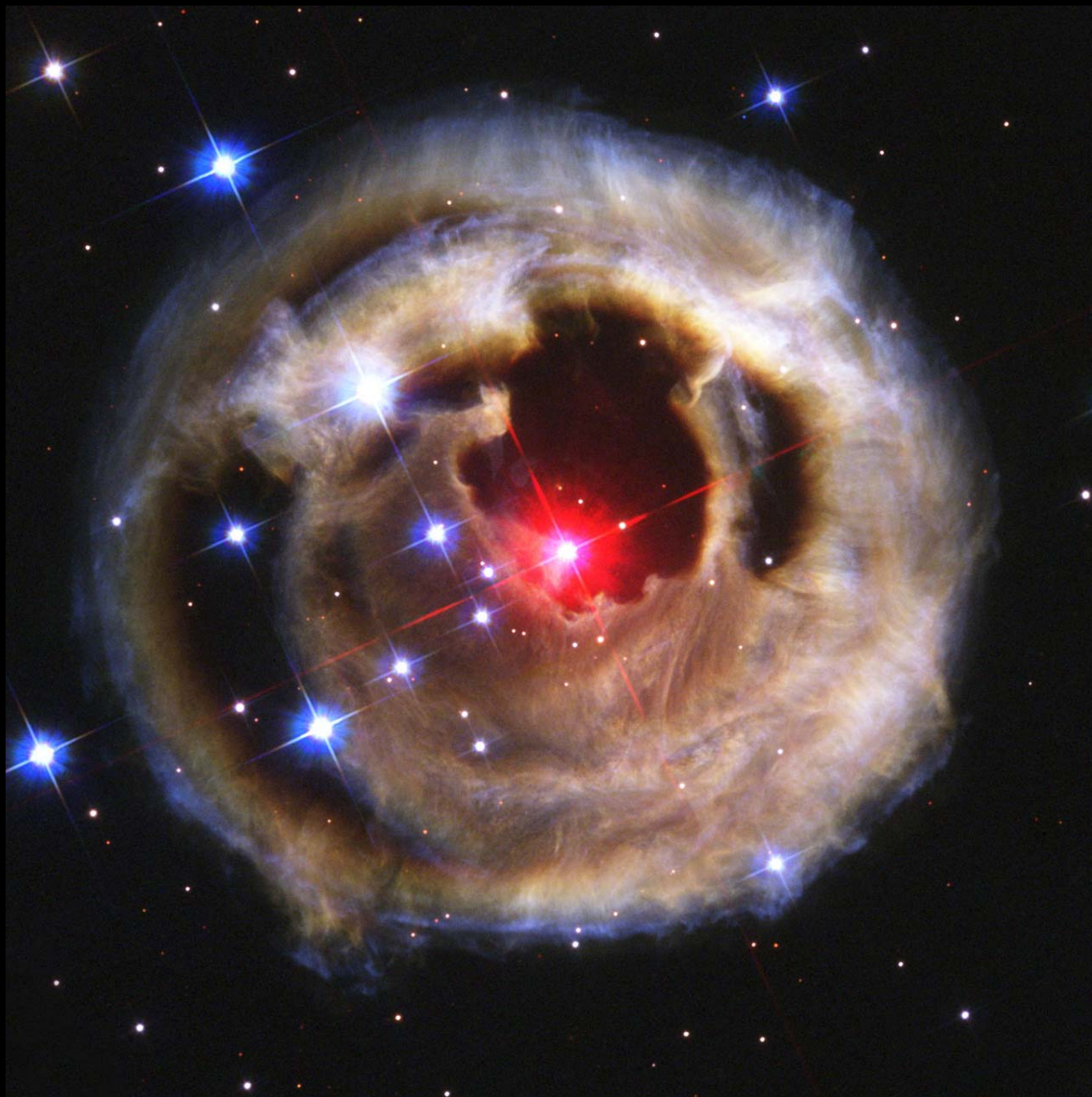




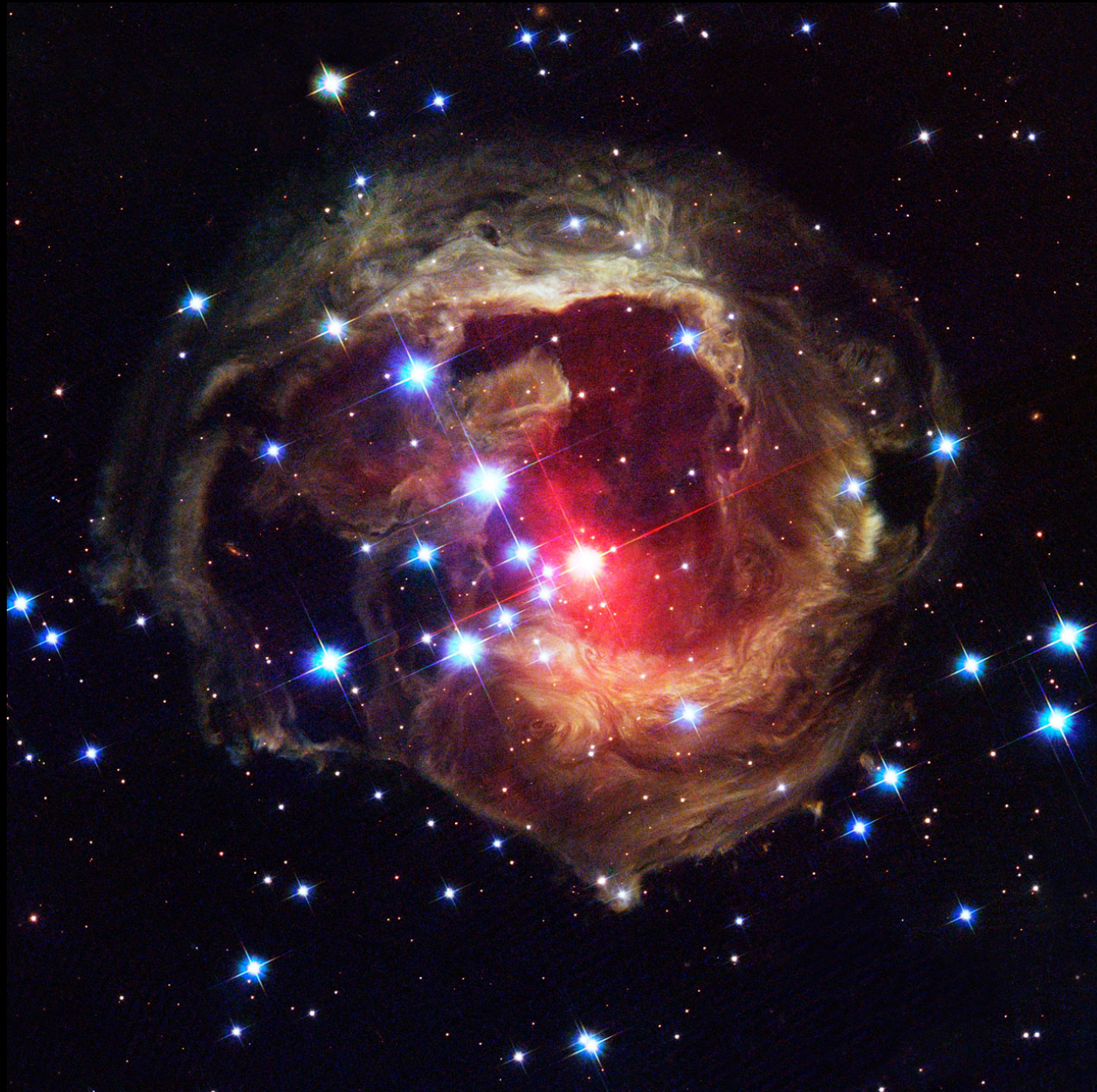
Supernova 1987A, in the Large Magellanic Cloud



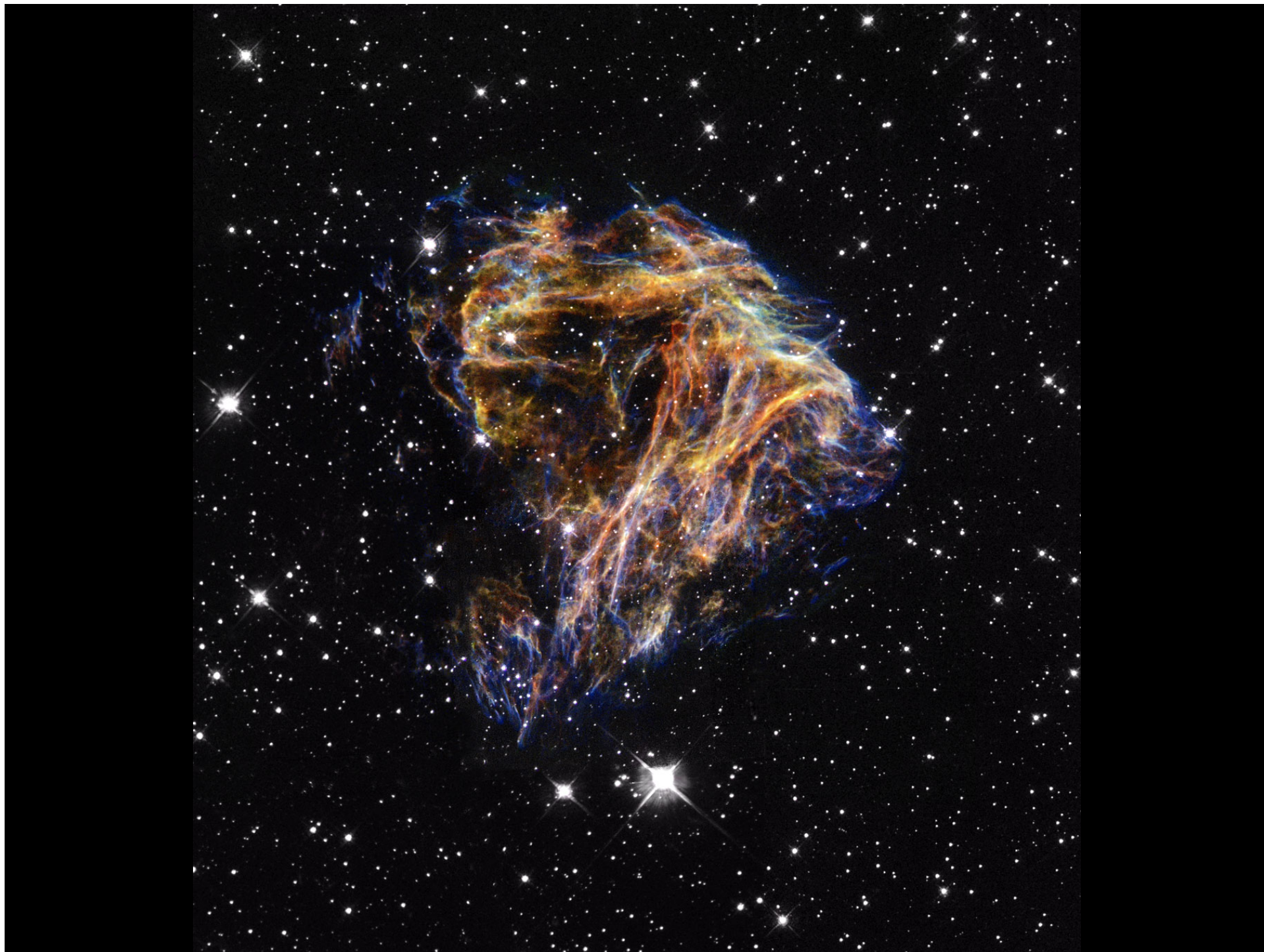




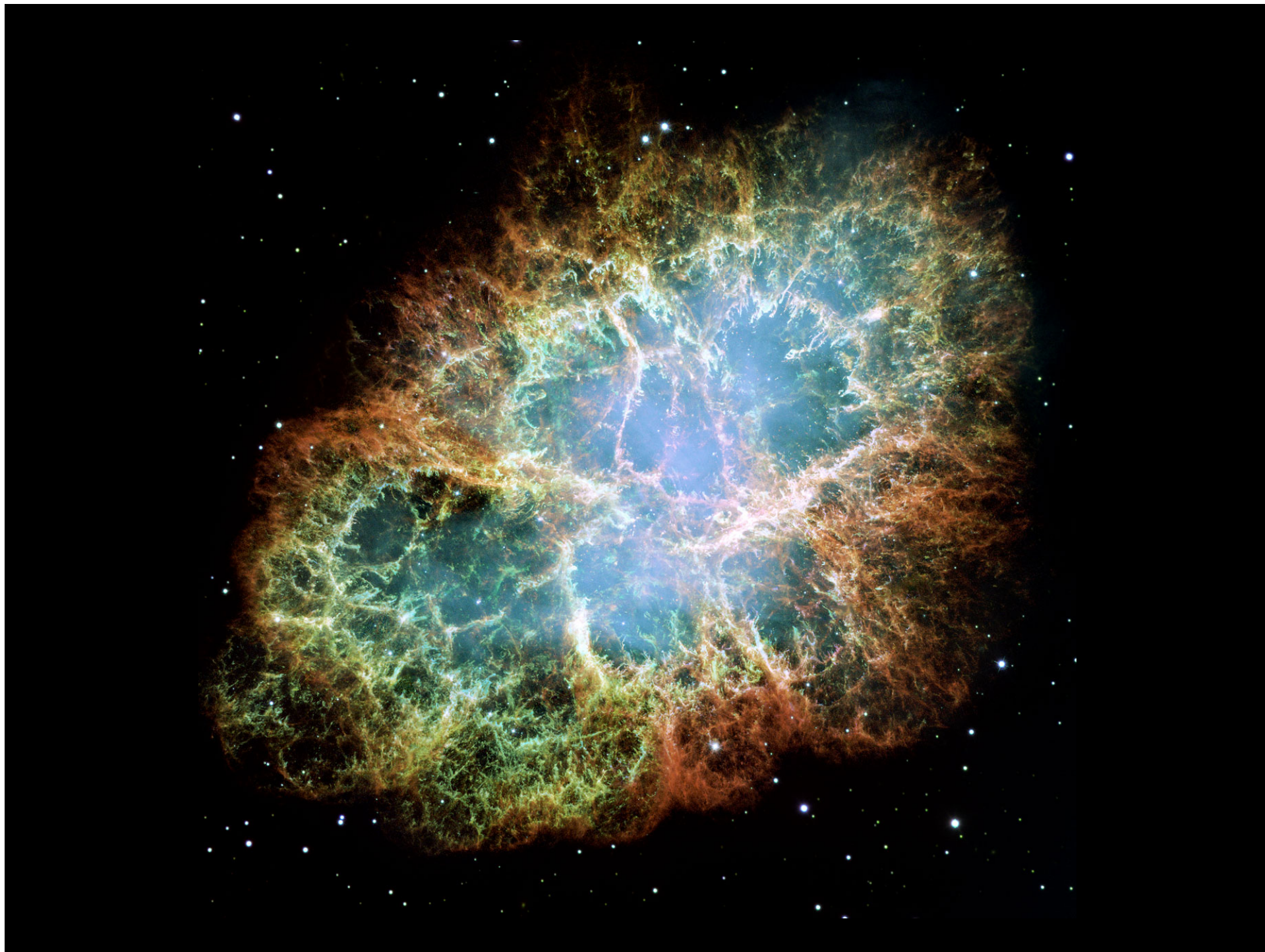




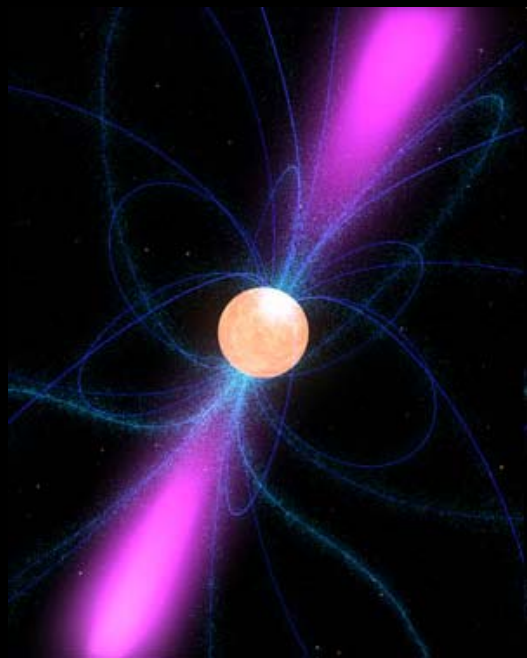




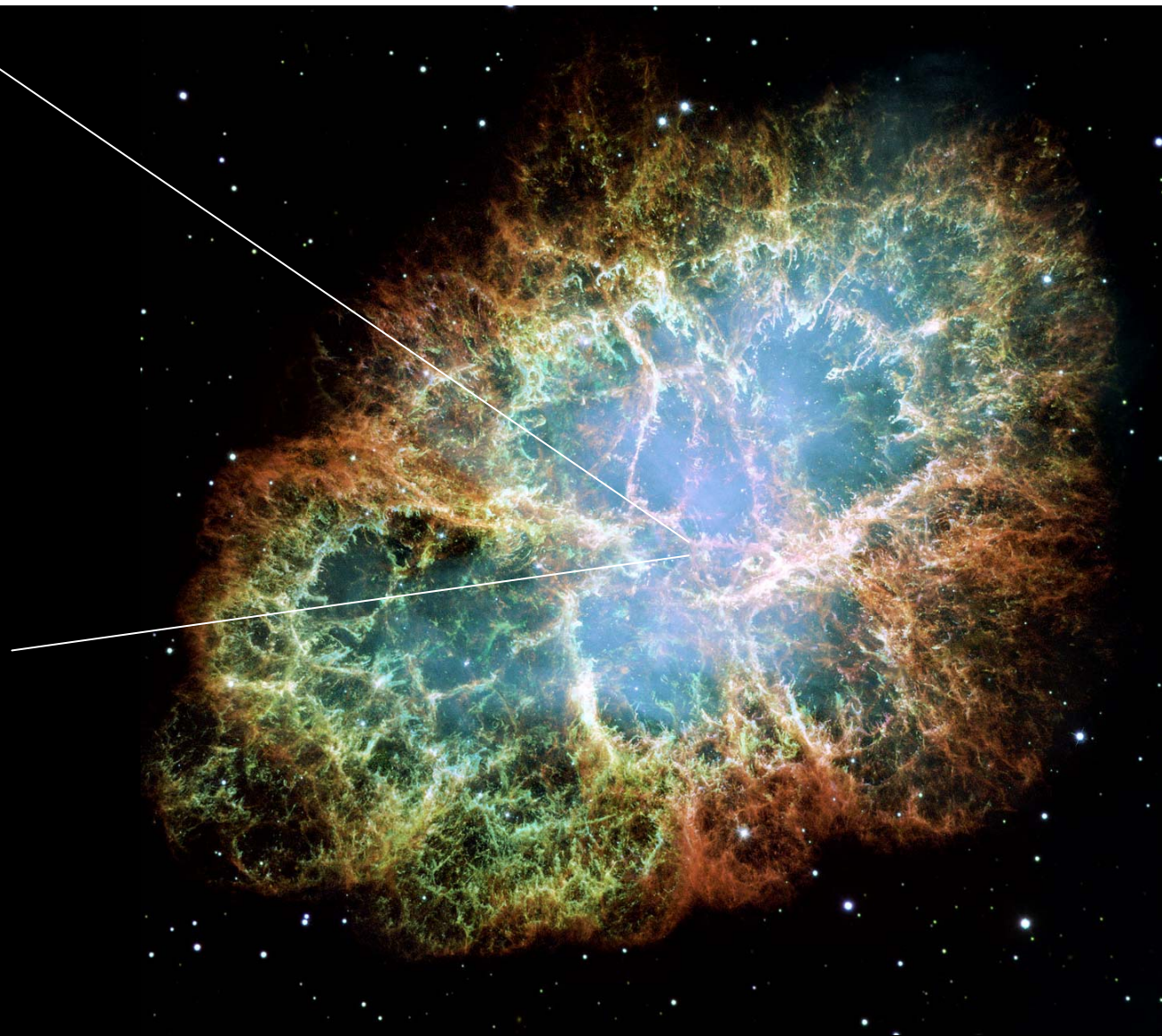




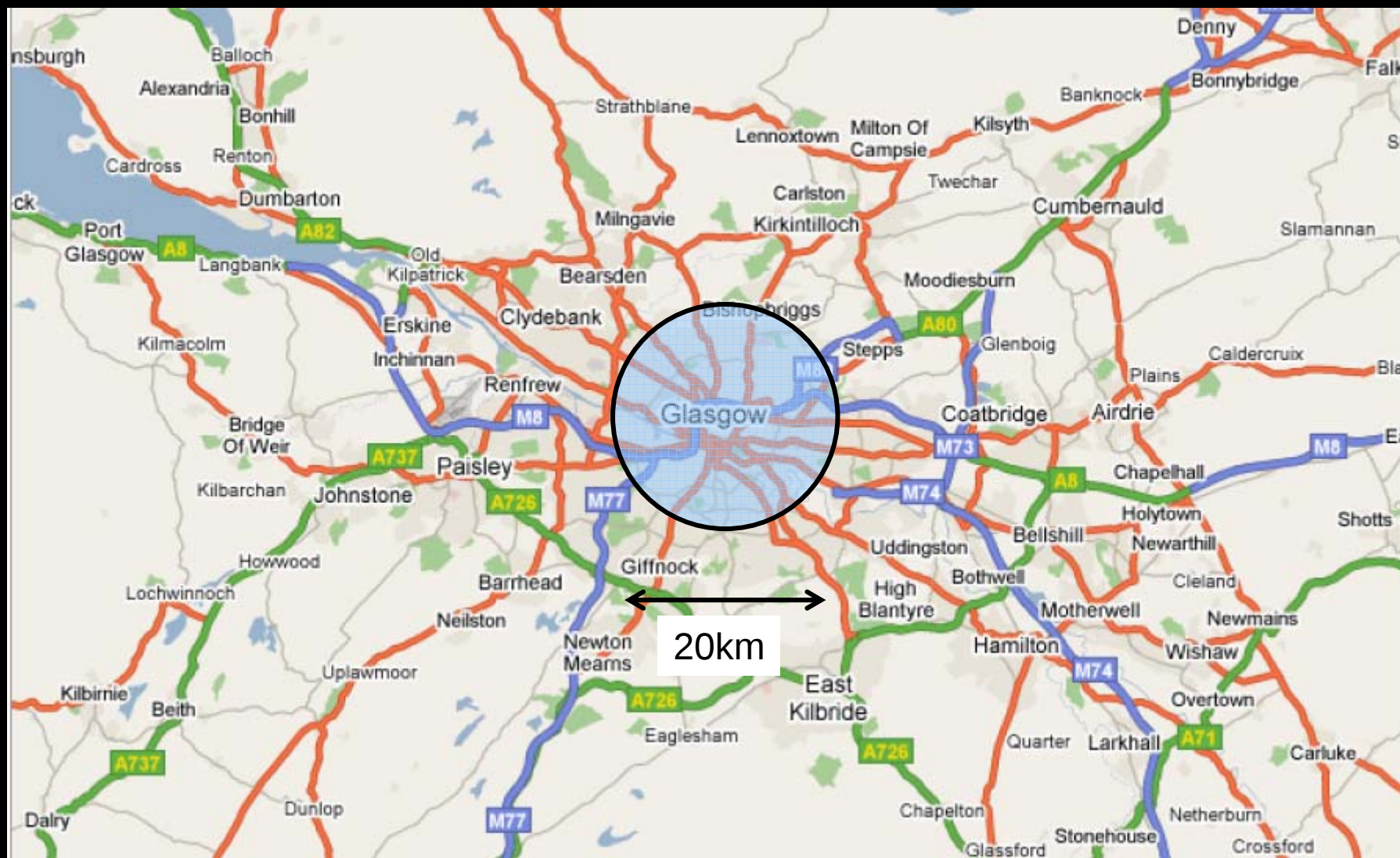


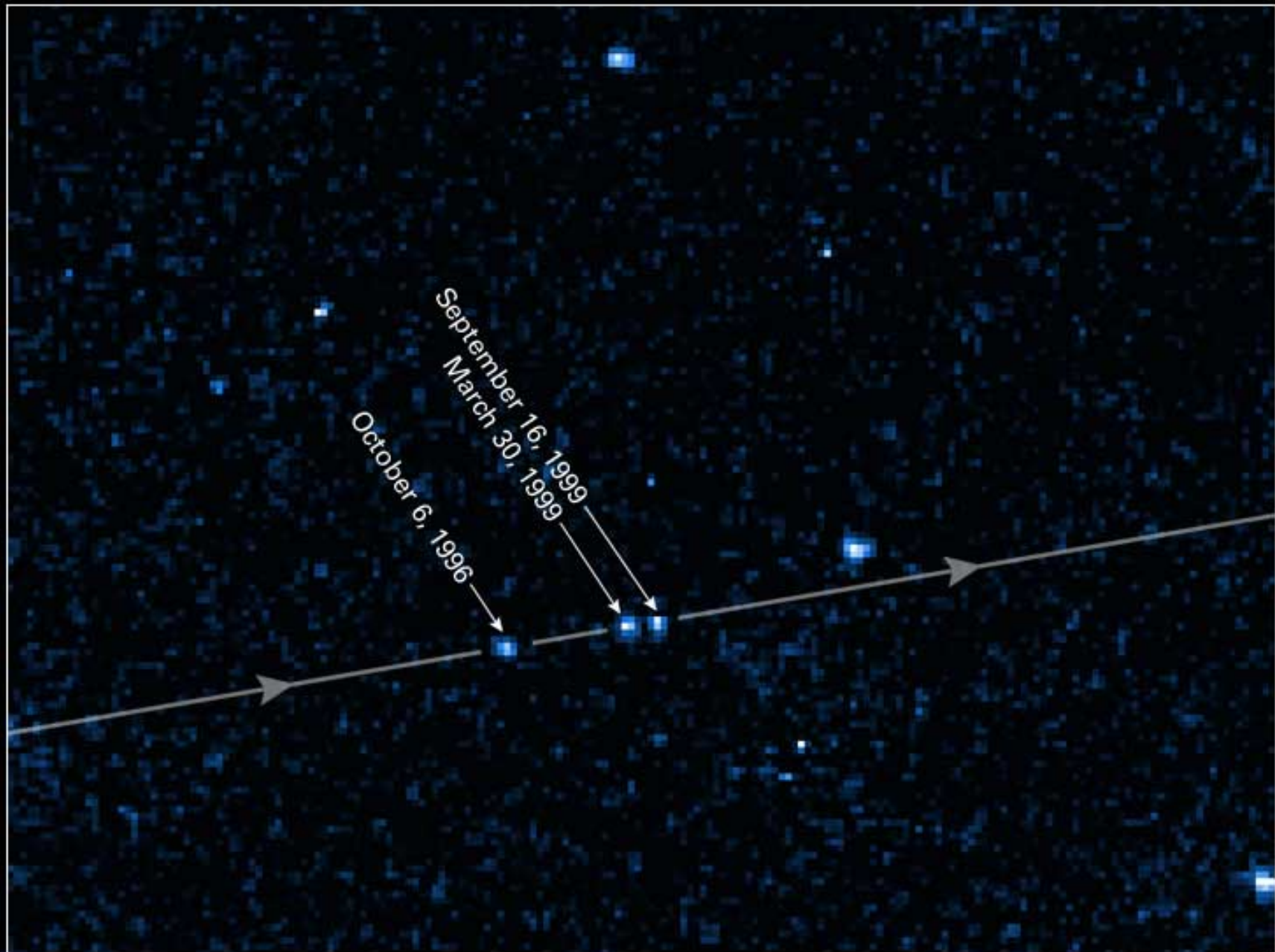


↔
10 km



10 light years

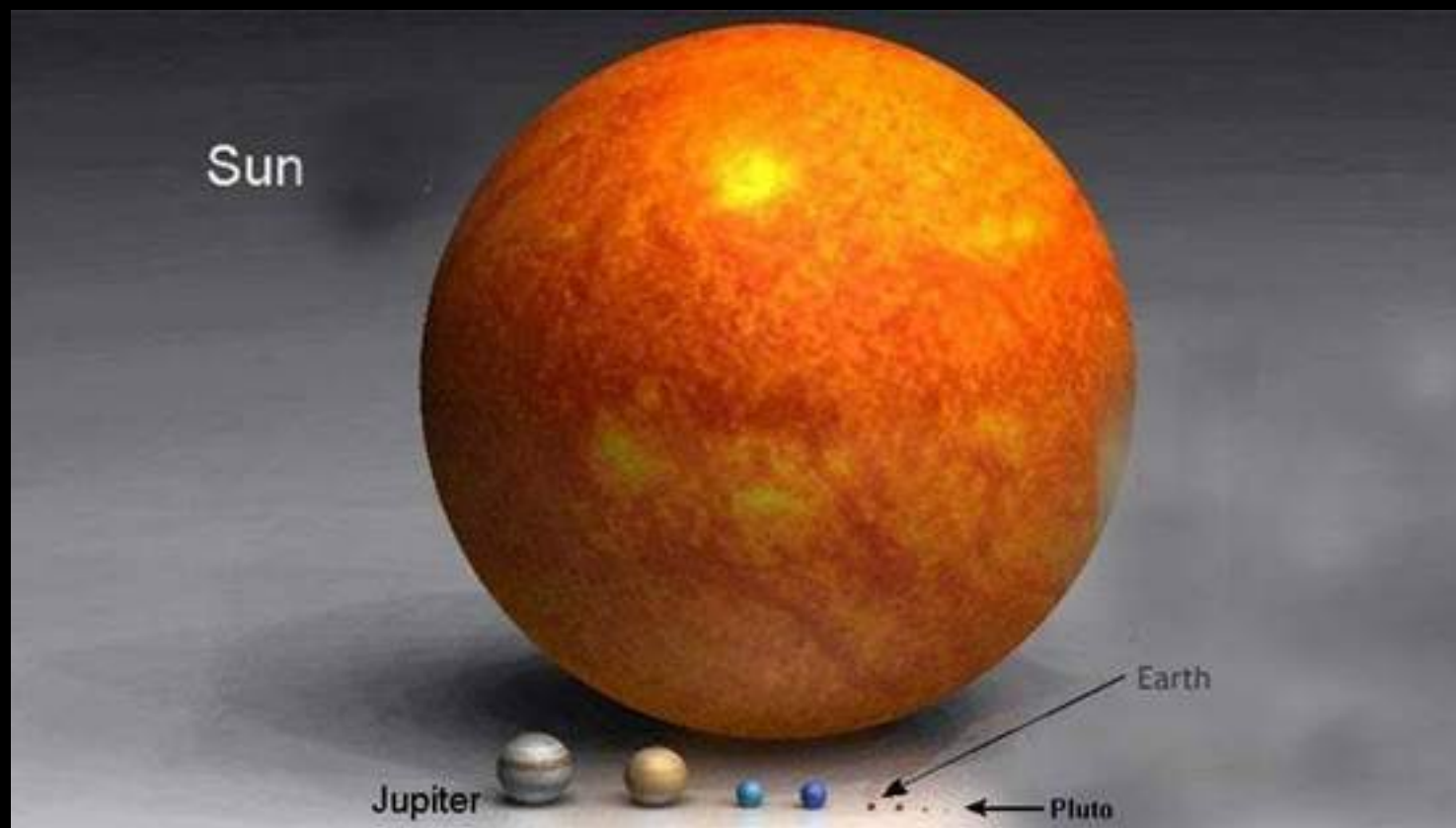


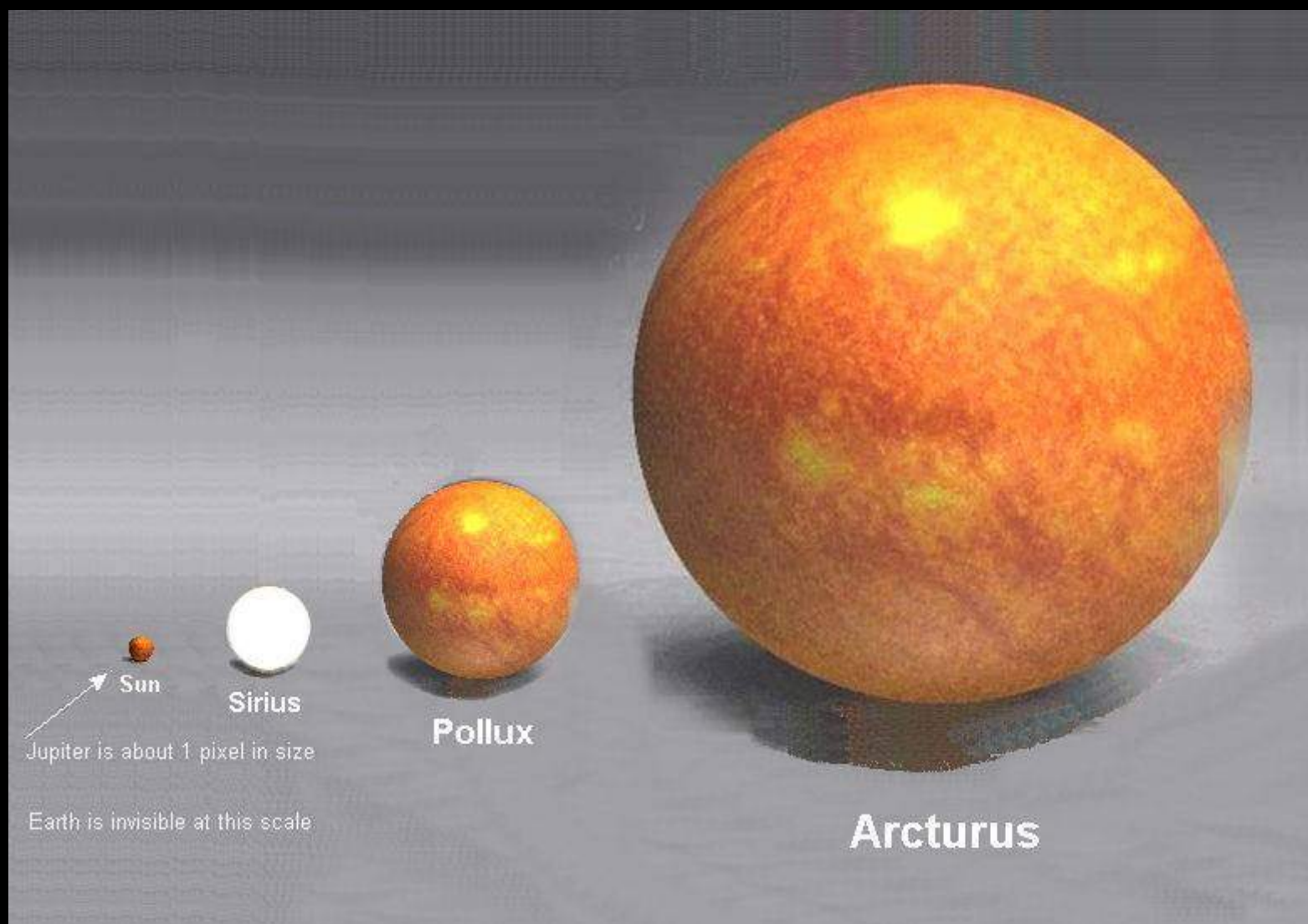


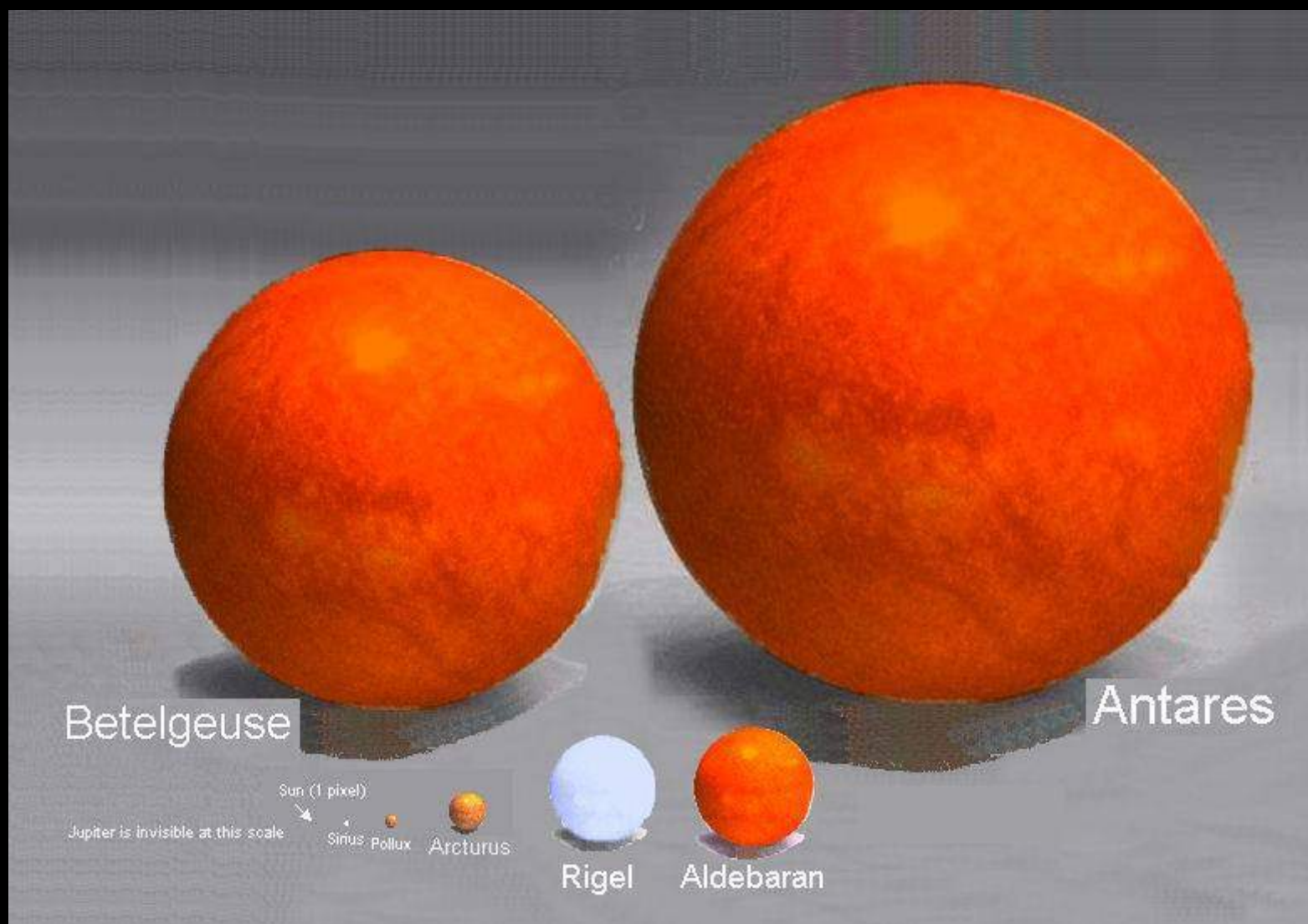
Neutron Star RX J185635-3754

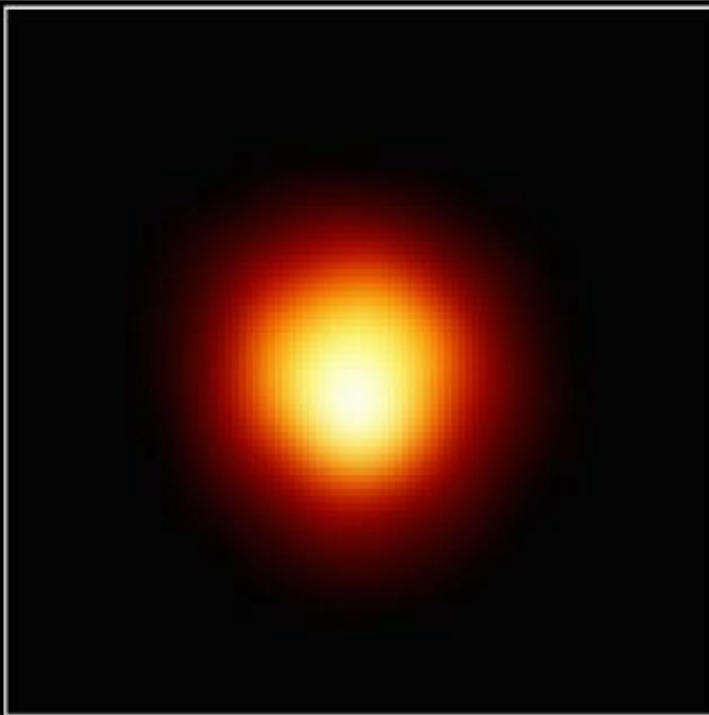
HST • WFPC2

NASA and F. Walter (State University of New York at Stony Brook) • STScI-PRC00-35









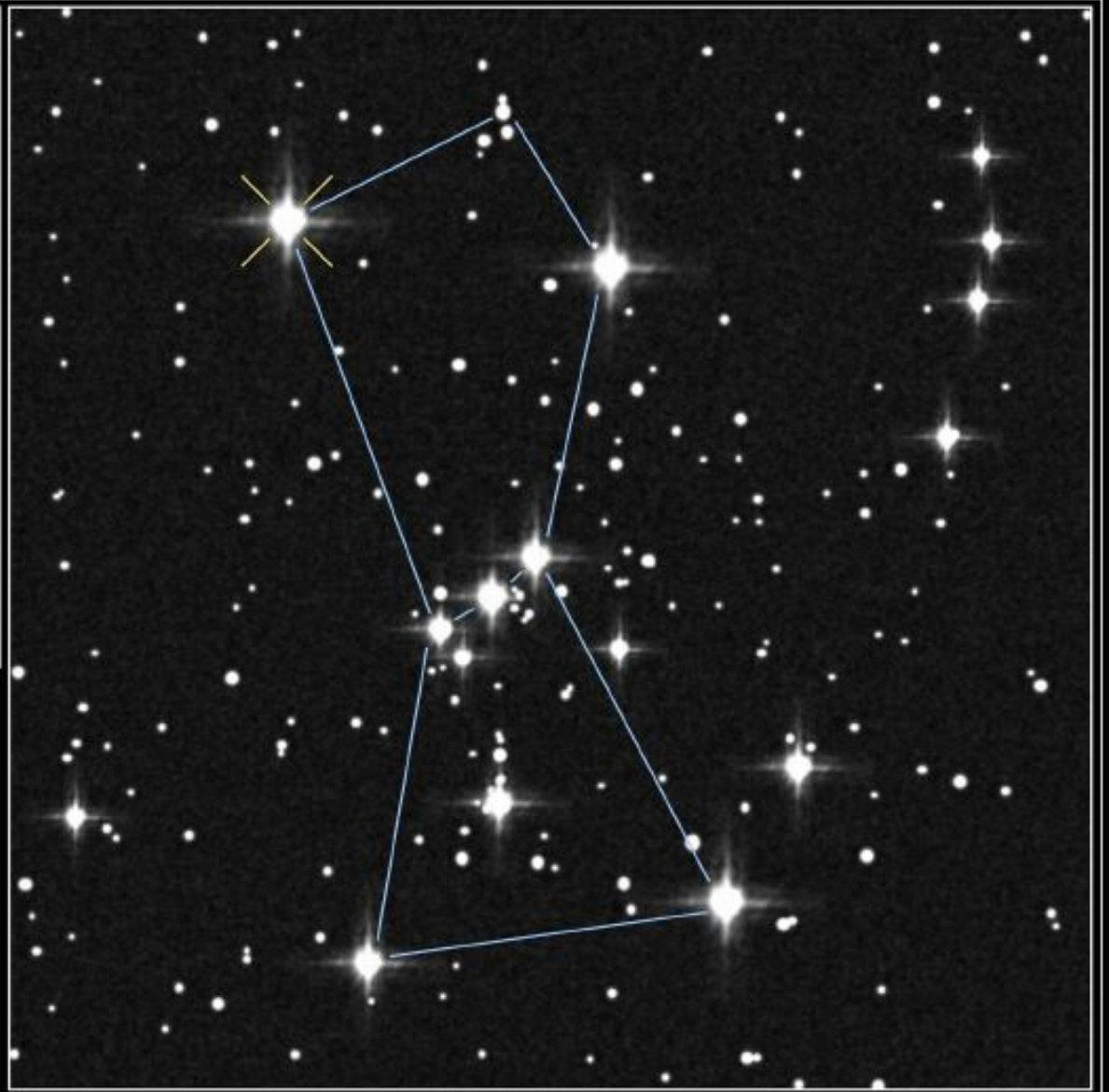
Size of Star



Size of Earth's Orbit



Size of Jupiter's Orbit





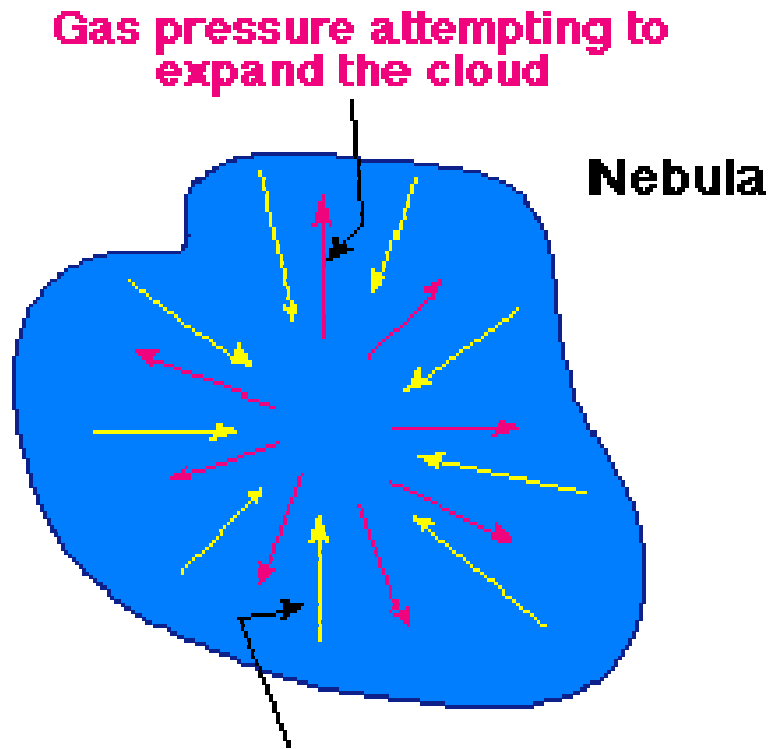
Giordano Bruno
(1548 - 1600)

*On the Infinite Universe and
worlds (1584)*

"...there is not merely one world,
one earth, one sun, but as many
worlds as we see bright lights
around us."

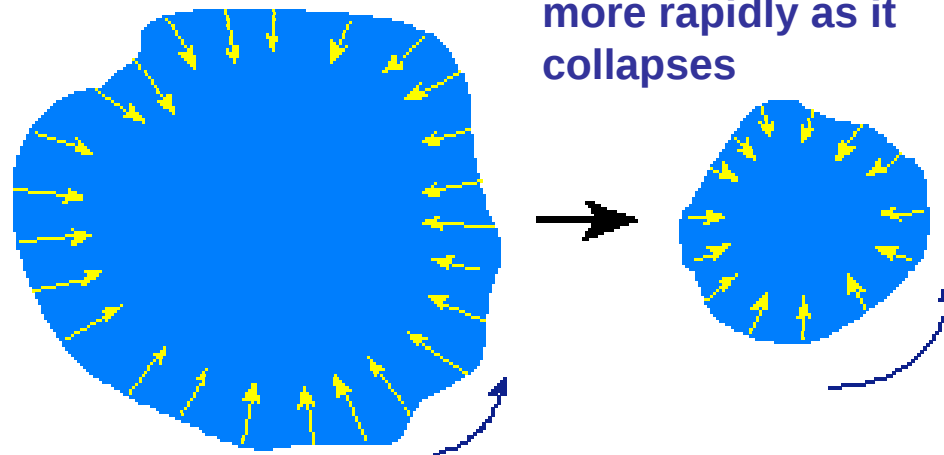
"all those worlds ... contain animals
and inhabitants no less than can our
own earth, since those worlds have
no less virtue nor a nature different
from that of our earth".

Forming stars and planets....



Gravitational force attempting to collapse the cloud

Pressure
versus
Gravity



Forming stars and planets....

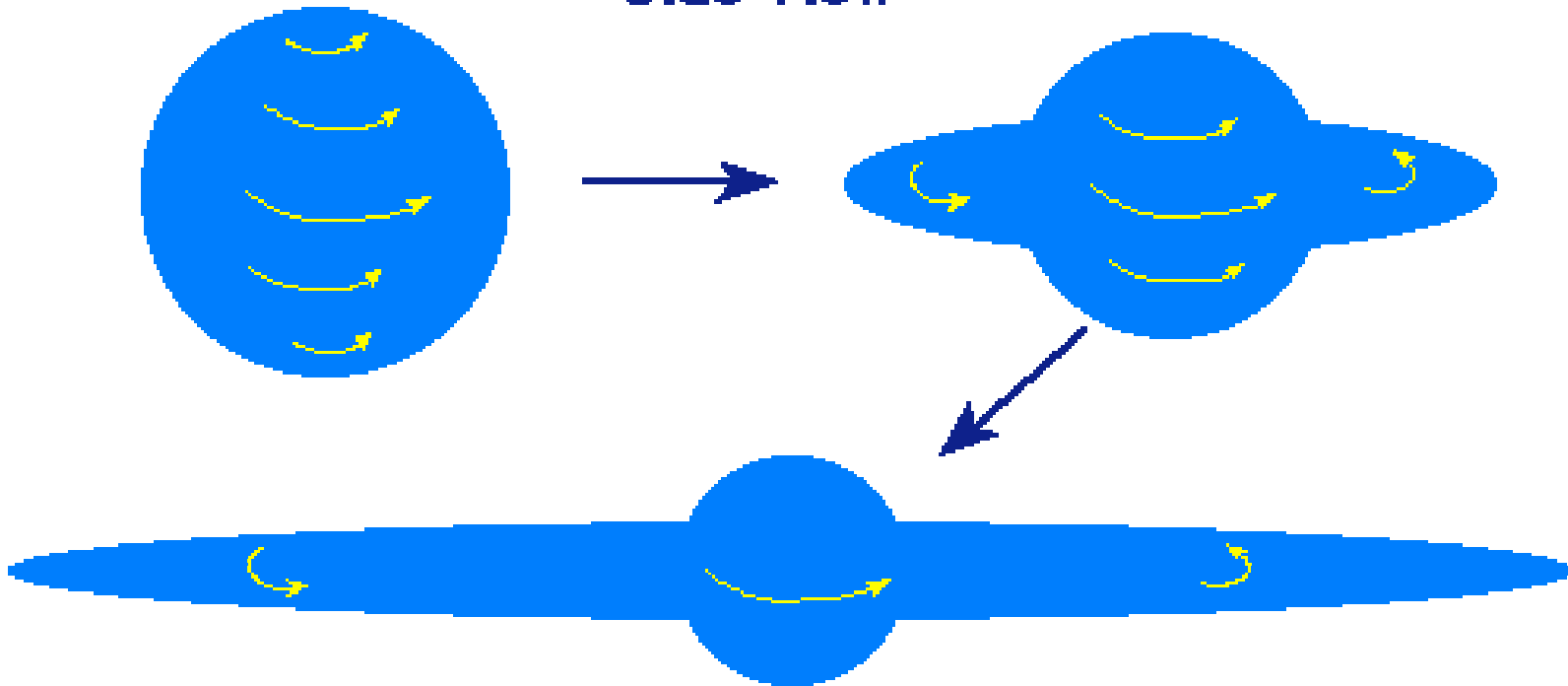
Pressure

versus

Gravity

As the nebula collapses
a disk forms

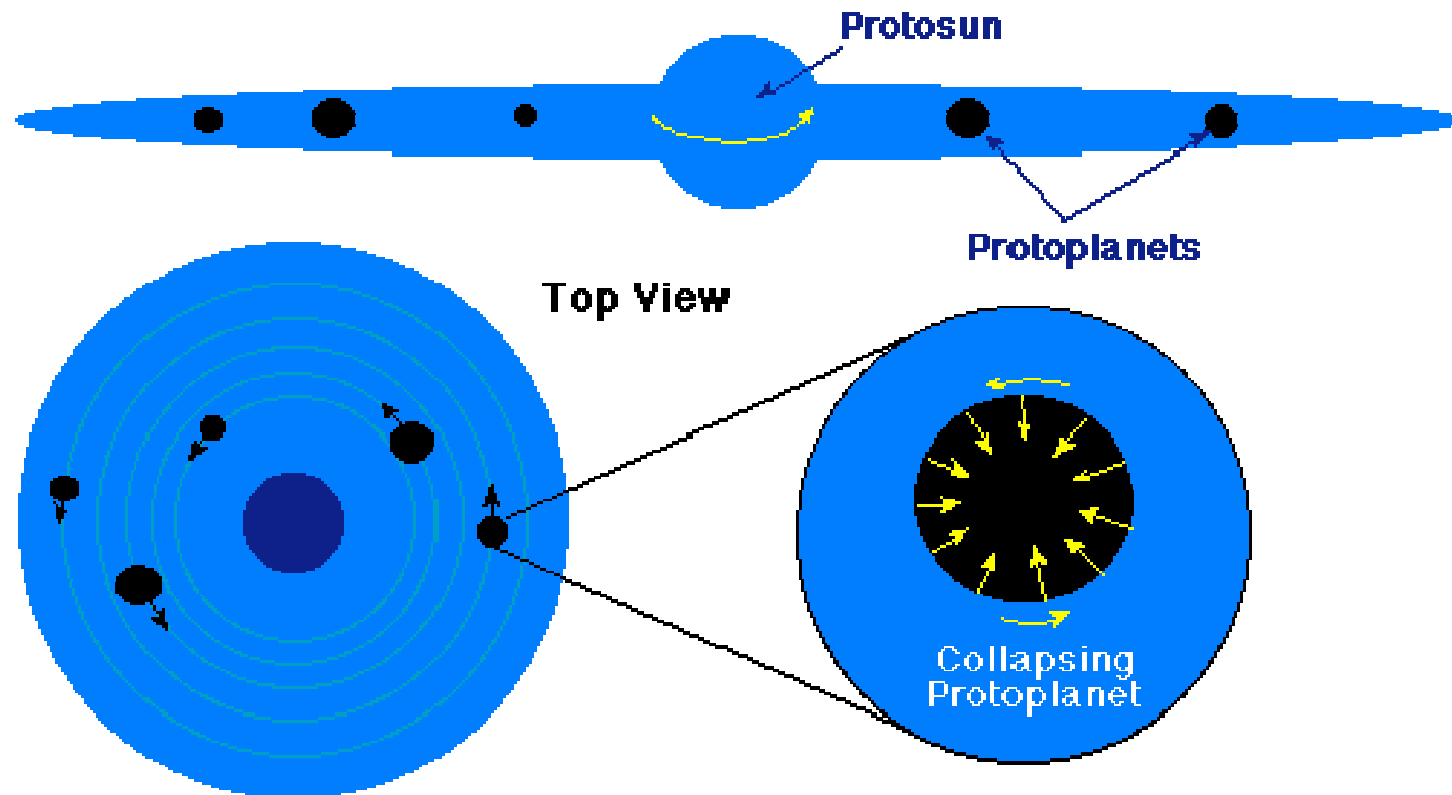
Side View



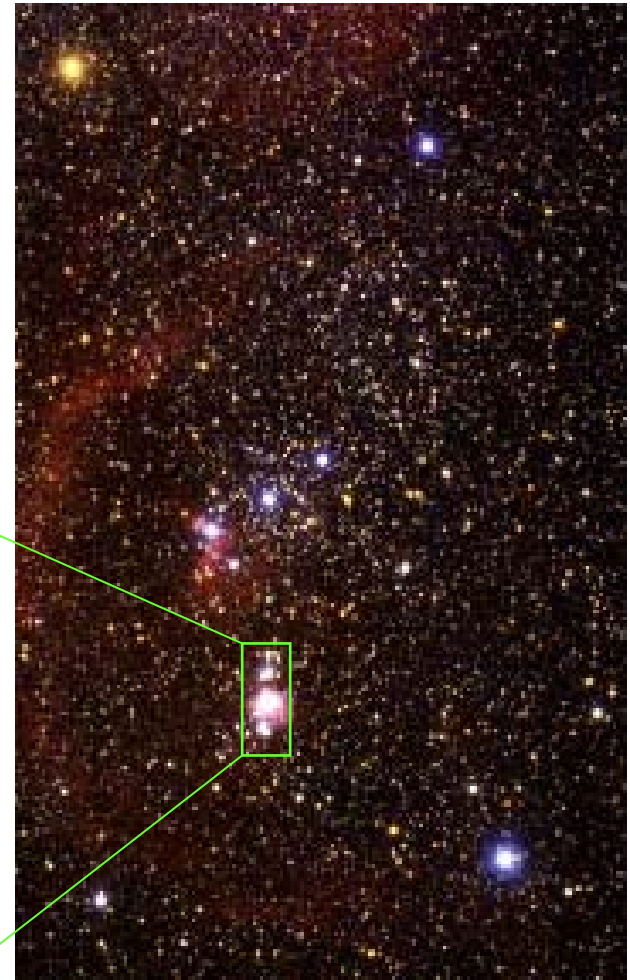
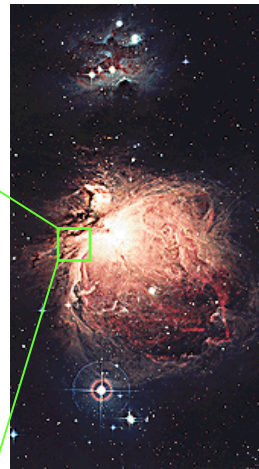
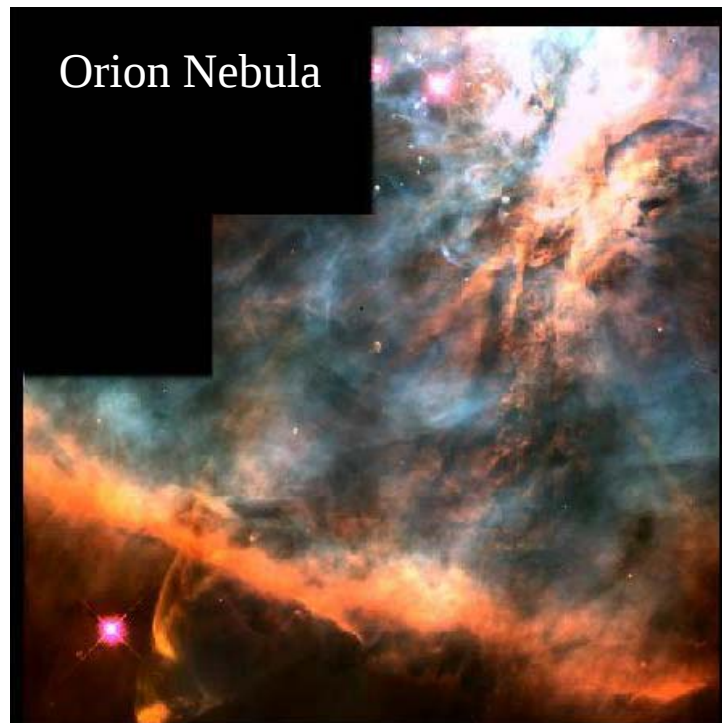
Forming stars and planets....

Pressure
versus
Gravity

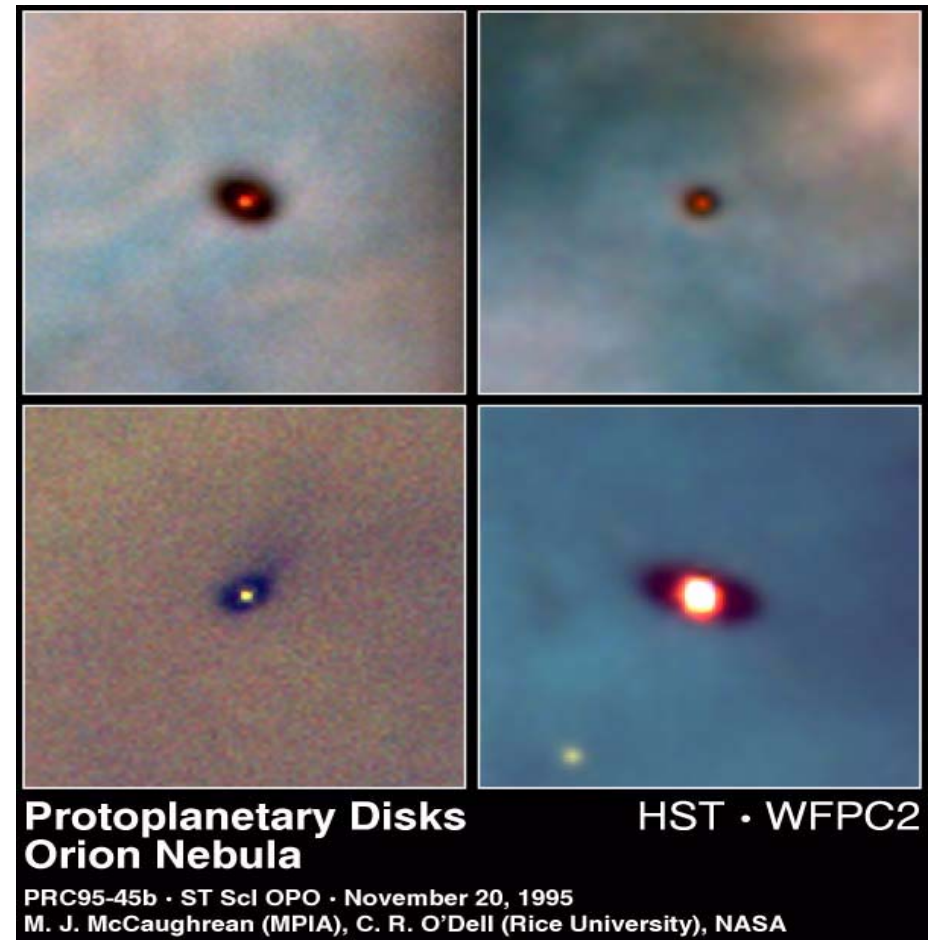
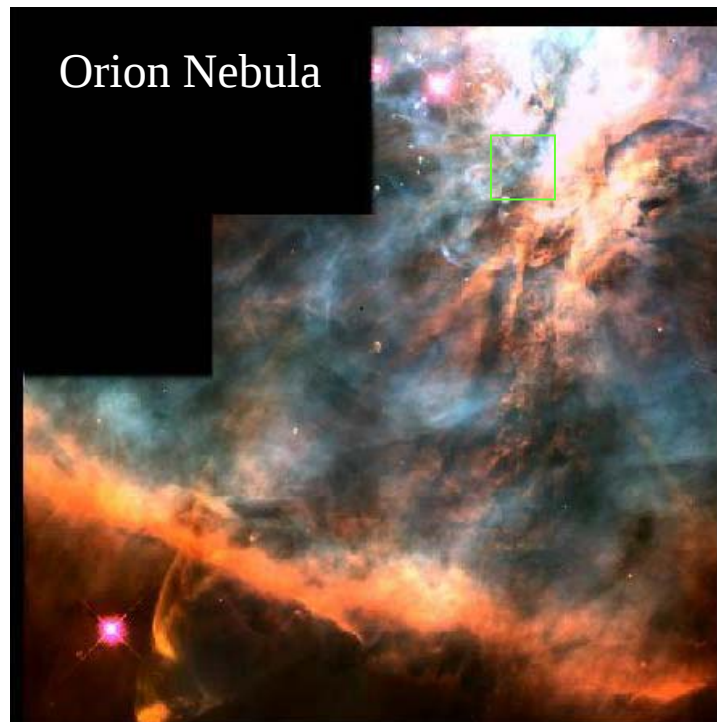
Lumps in the disk form
planets

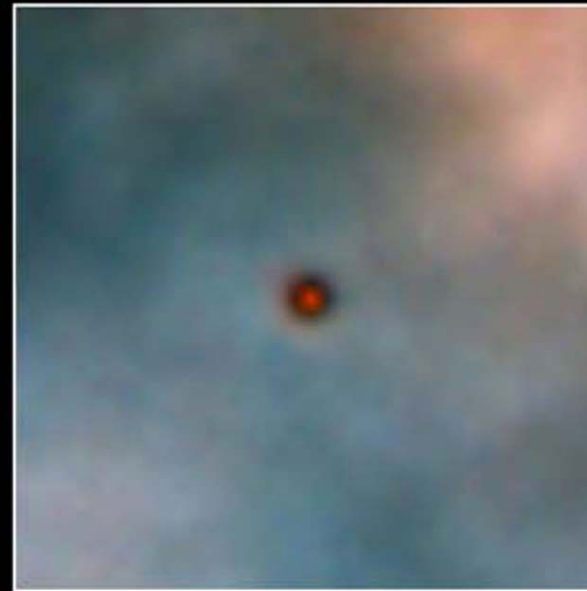


Star forms from gravitational collapse of gas cloud. Angular momentum conservation leads to **proto-planetary disk**



Star forms from gravitational collapse of gas cloud. Angular momentum conservation leads to **proto-planetary disk**





**Protoplanetary Disks
Orion Nebula**

HST • WFPC2

PRC95-45b • ST ScI OPO • November 20, 1995

M. J. McCaughrean (MPIA), C. R. O'Dell (Rice University), NASA

In the past 14 years we have found many planets orbiting other stars in our galaxy...



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Exoplanet: *n.* a planet that orbits a star outside the solar system.

CURRENT PLANET COUNT:

336

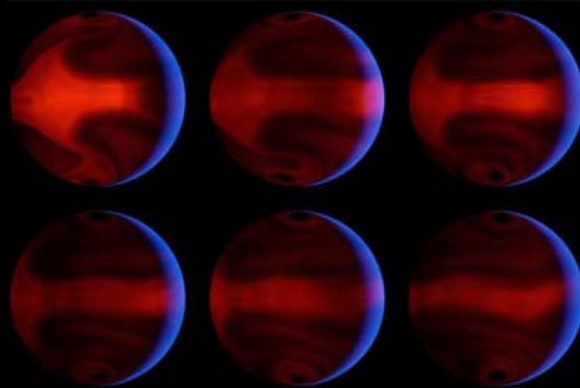
stars with planets: 285

Earthlike planets: 0

get this on your desktop

Heat of the Moment

Spitzer tracks exoplanet's wild temperature swings



Explore the
NEW WORLDS ATLAS
A visual guide to exoplanets

MORE STORIES



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Team begins search for Earths in the Sun's backyard.

01.15.09



Kepler arrives in Florida

Planet-hunter scheduled to launch in March.

01.07.08



The next generation

Bill Nye and Neil Tyson discuss Carl Sagan's legacy.

12.22.08



Vital Signs

Astronomers find carbon dioxide on an exoplanet.

11.13.08

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Launches March 5, 10:48 AM

