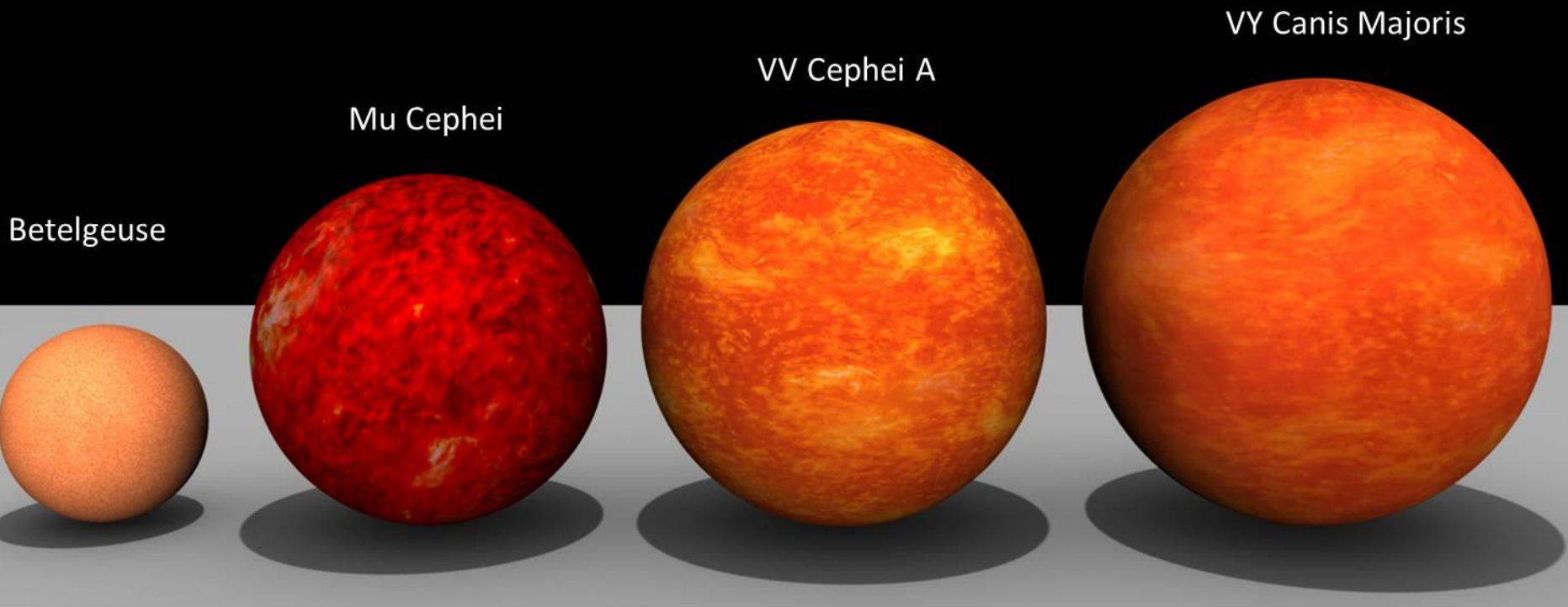
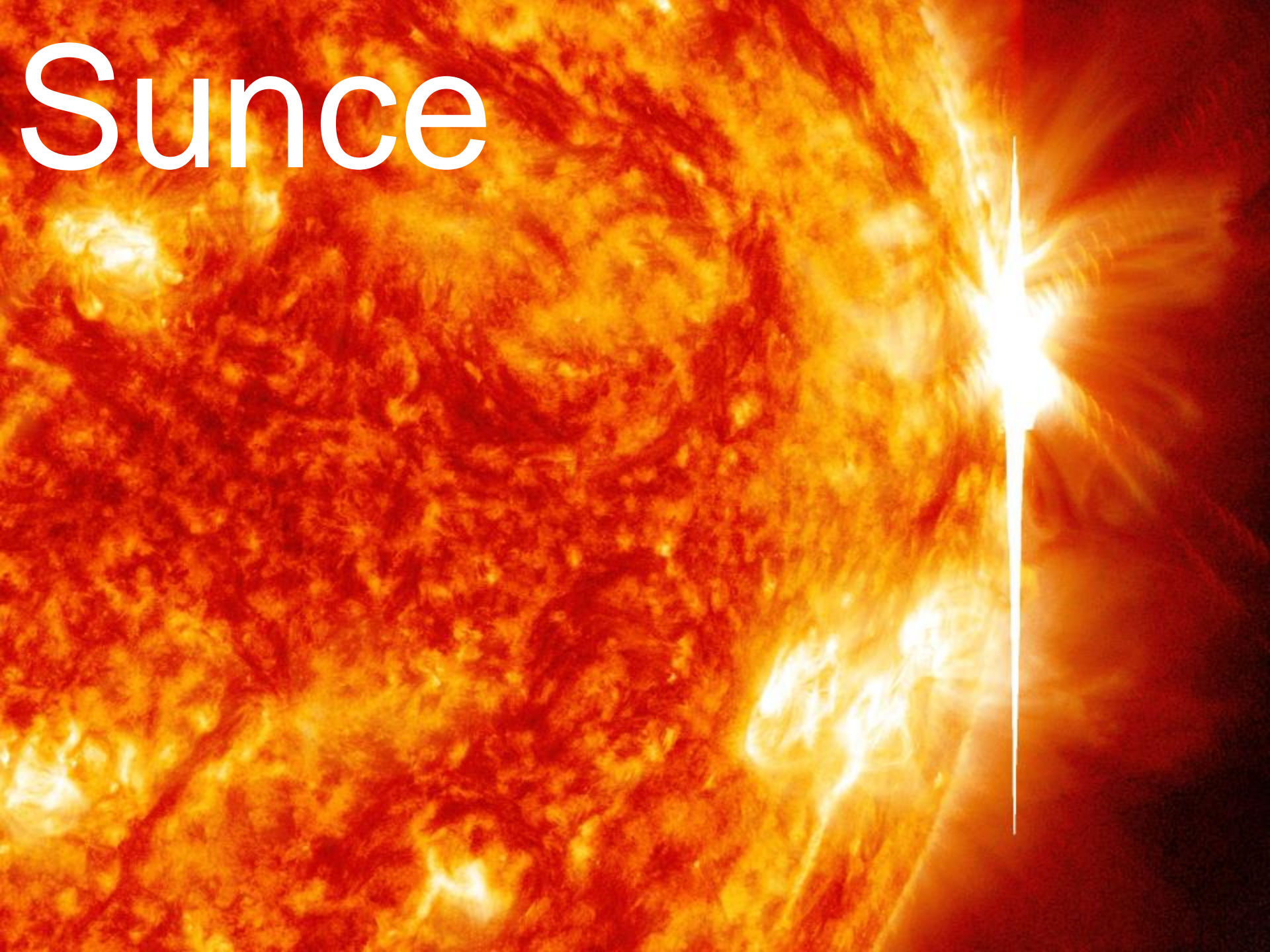


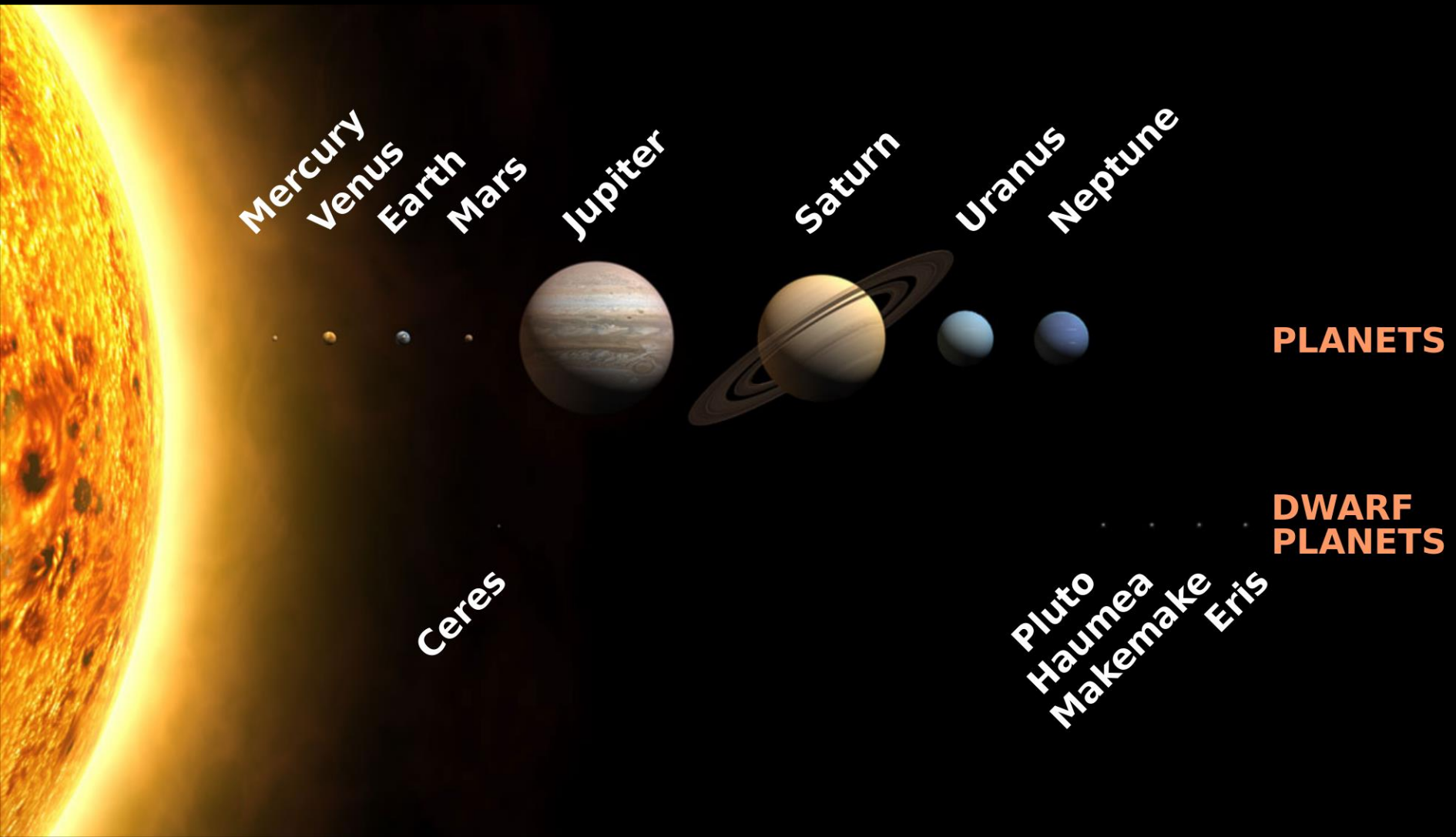
VY CANIS MAJORIS



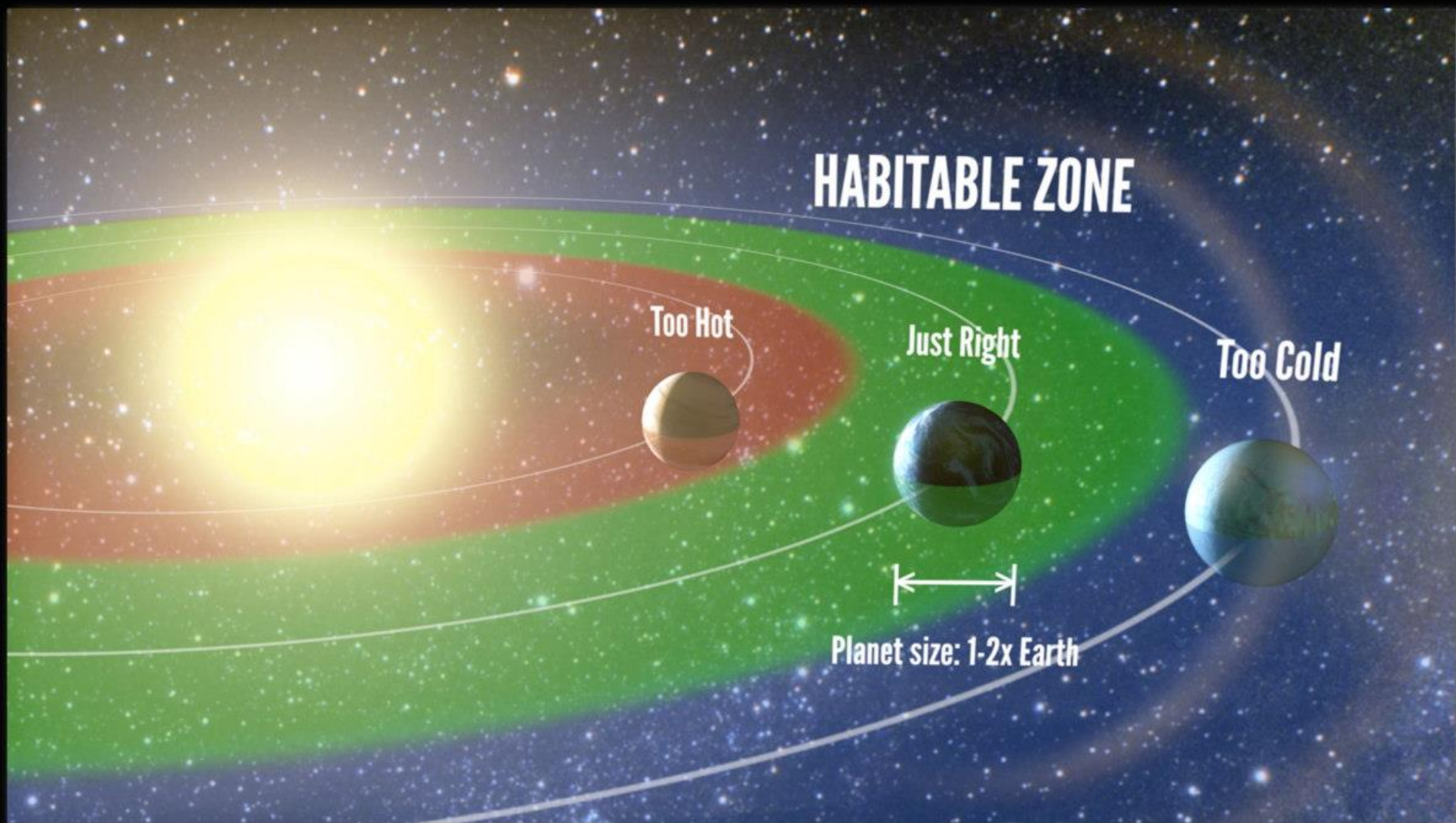
Sunce



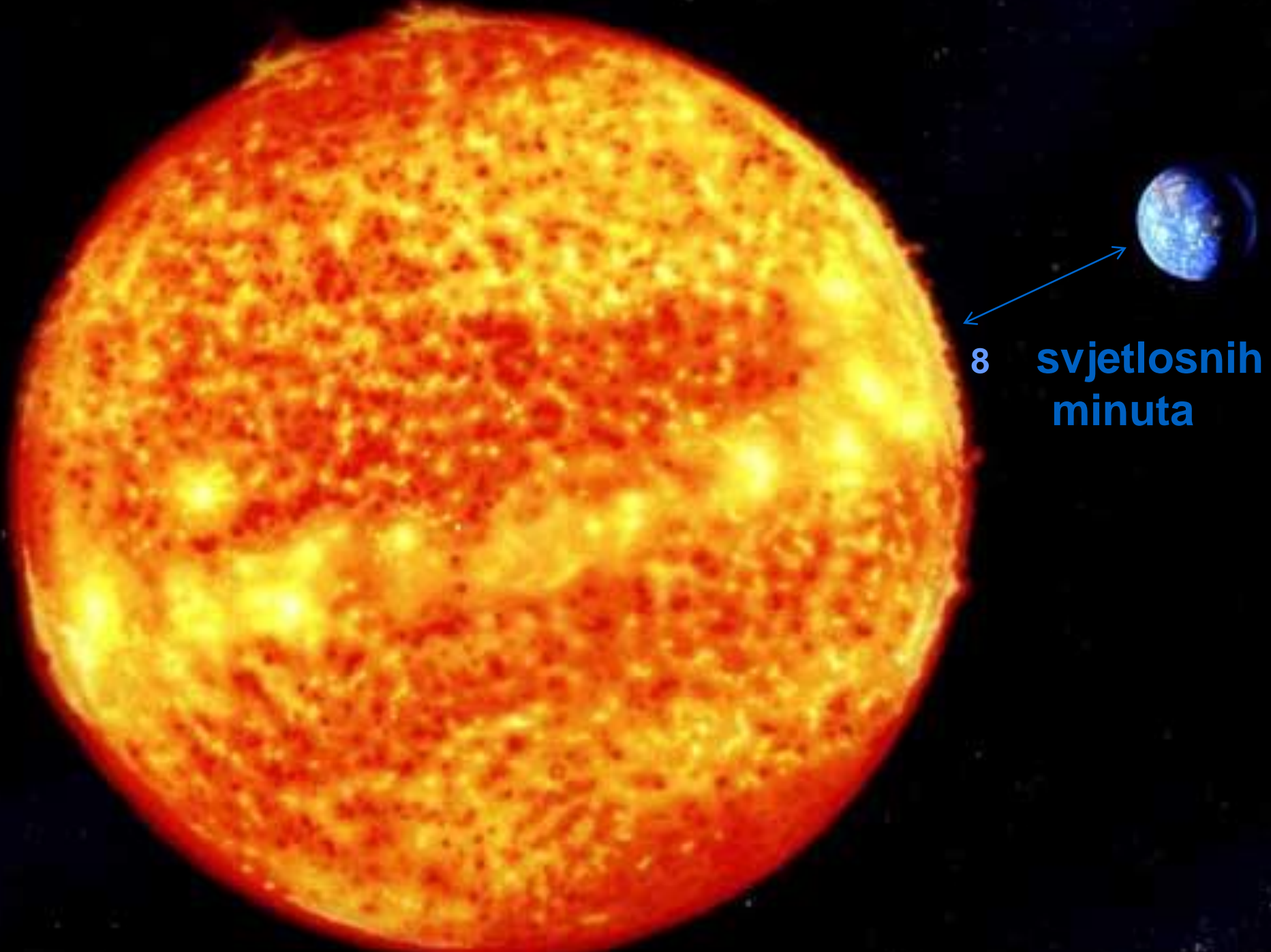
Čini više od 99% mase Sunčevog sustava



Ogroman izvor energije



The habitable zone corresponds to the range of orbital distances where liquid water can exist on a planet's surface.



**8 svjetlosnih
minuta**



PROXIMA CENTAURI

4,2 svjetlosne godine

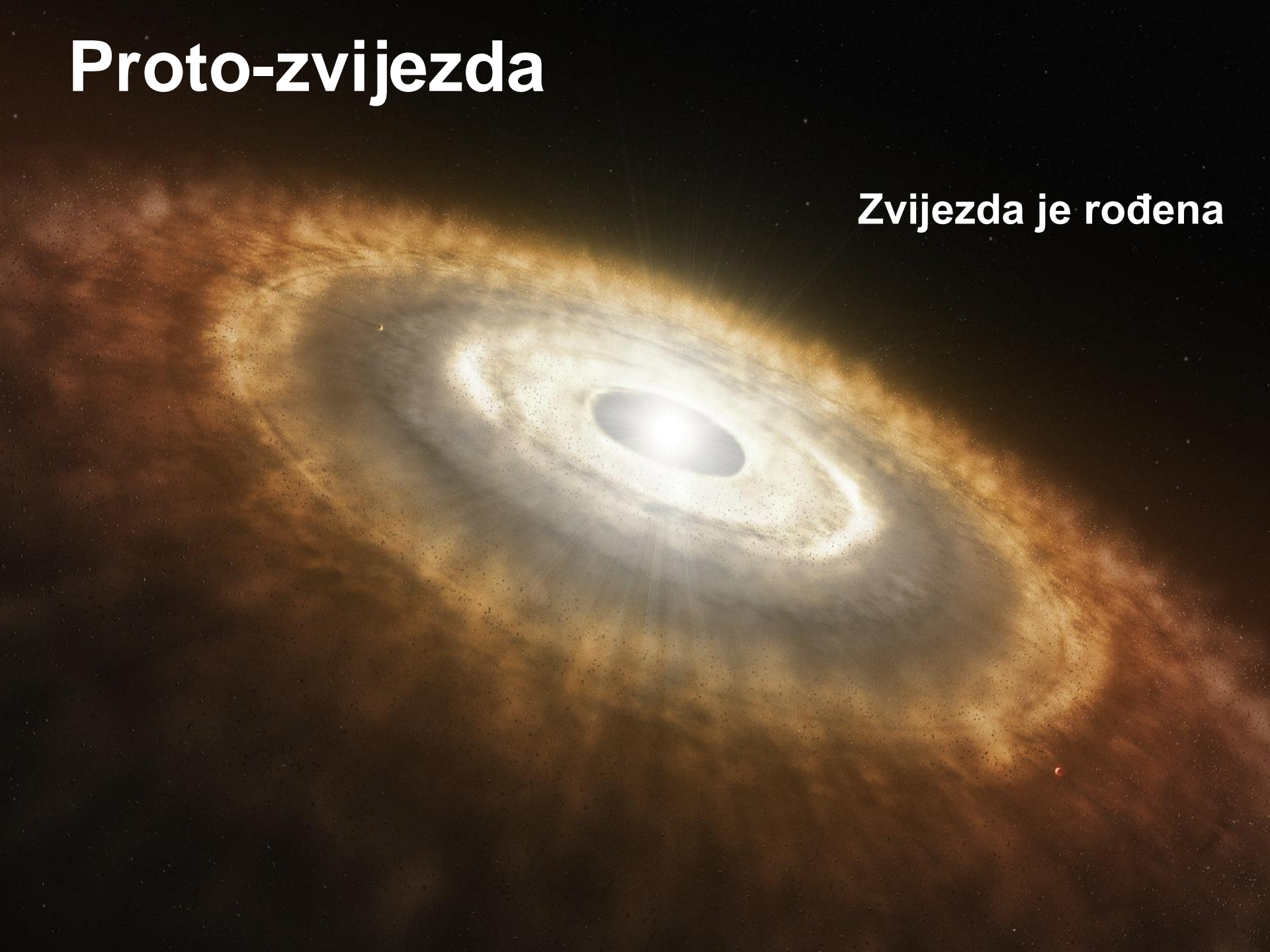


Kako se rađaju zvijezde?



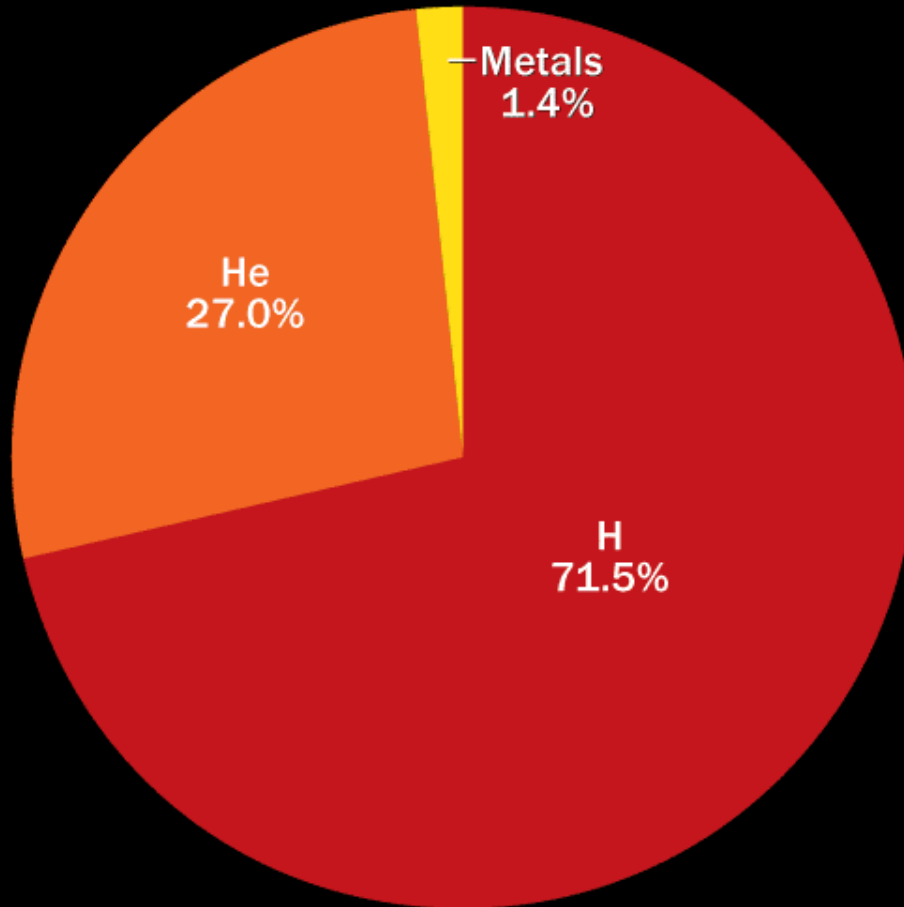
Proto-zvijezda

Zvijezda je rođena

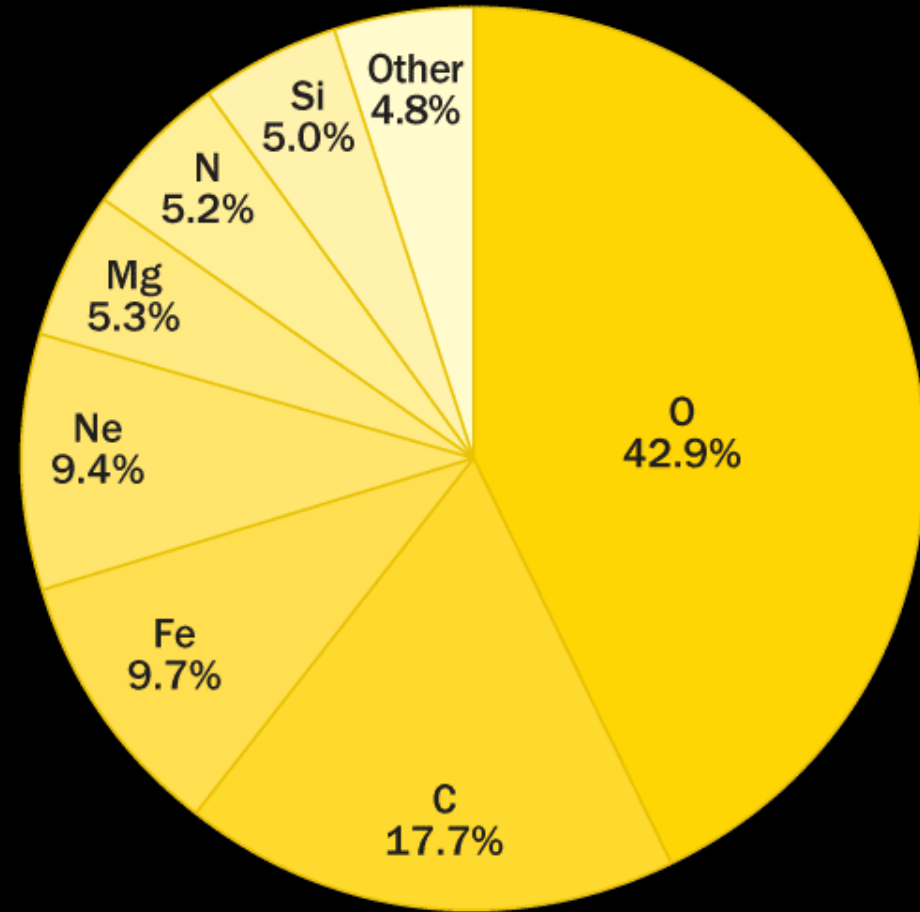


Od čega se sastoje zvijezde?

Total solar composition

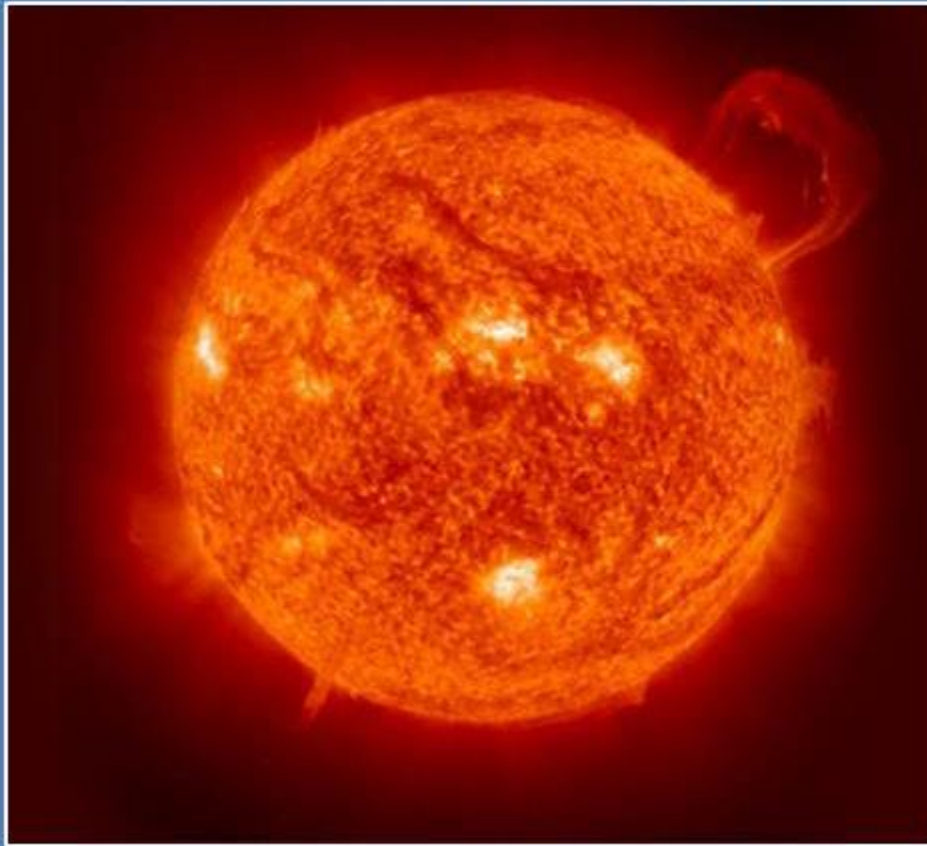


Metal composition



SOURCE: M. ASPLUND

SURFACE TEMPERATURE OF THE SUN & EARTH



6,000K (5,727°C or 10,340°F)



288K (15°C or 59°F)

A diagram of the Sun showing its internal layers and outer atmosphere. The core is a bright yellow sphere. Surrounding it is a thin orange layer, followed by a red layer, and then a thick, glowing red and orange outer atmosphere. The background is dark red with some white specks.

— 1 000 000 °C *Corona*

— 10 000 °C *Upper Chromosphere*

— 4 000 °C *Lower Chromosphere*

— 6 000 °C *Photosphere*

Internal structure:

core
radiative zone
convection zone

Subsurface flows

Photosphere

Sun spots

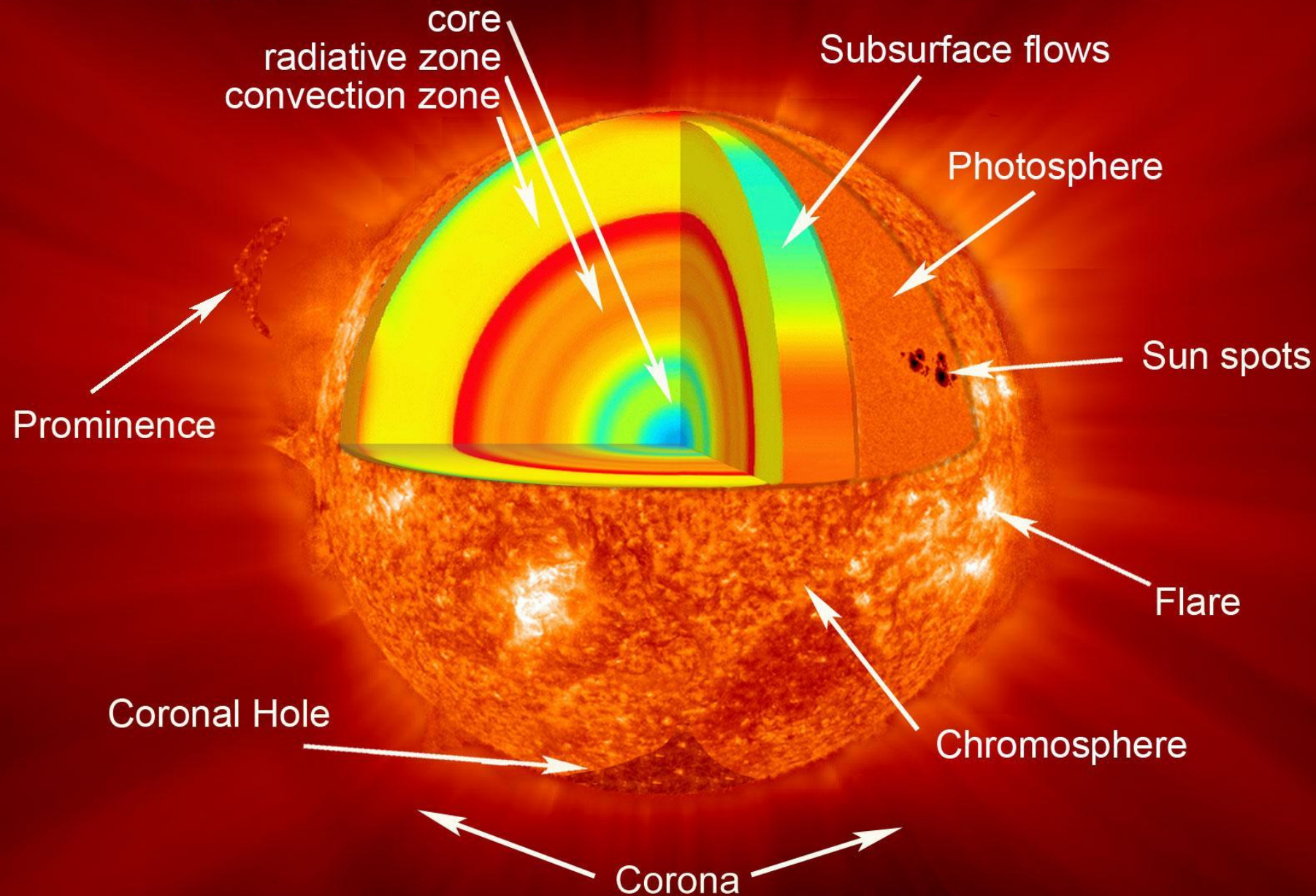
Flare

Chromosphere

Corona

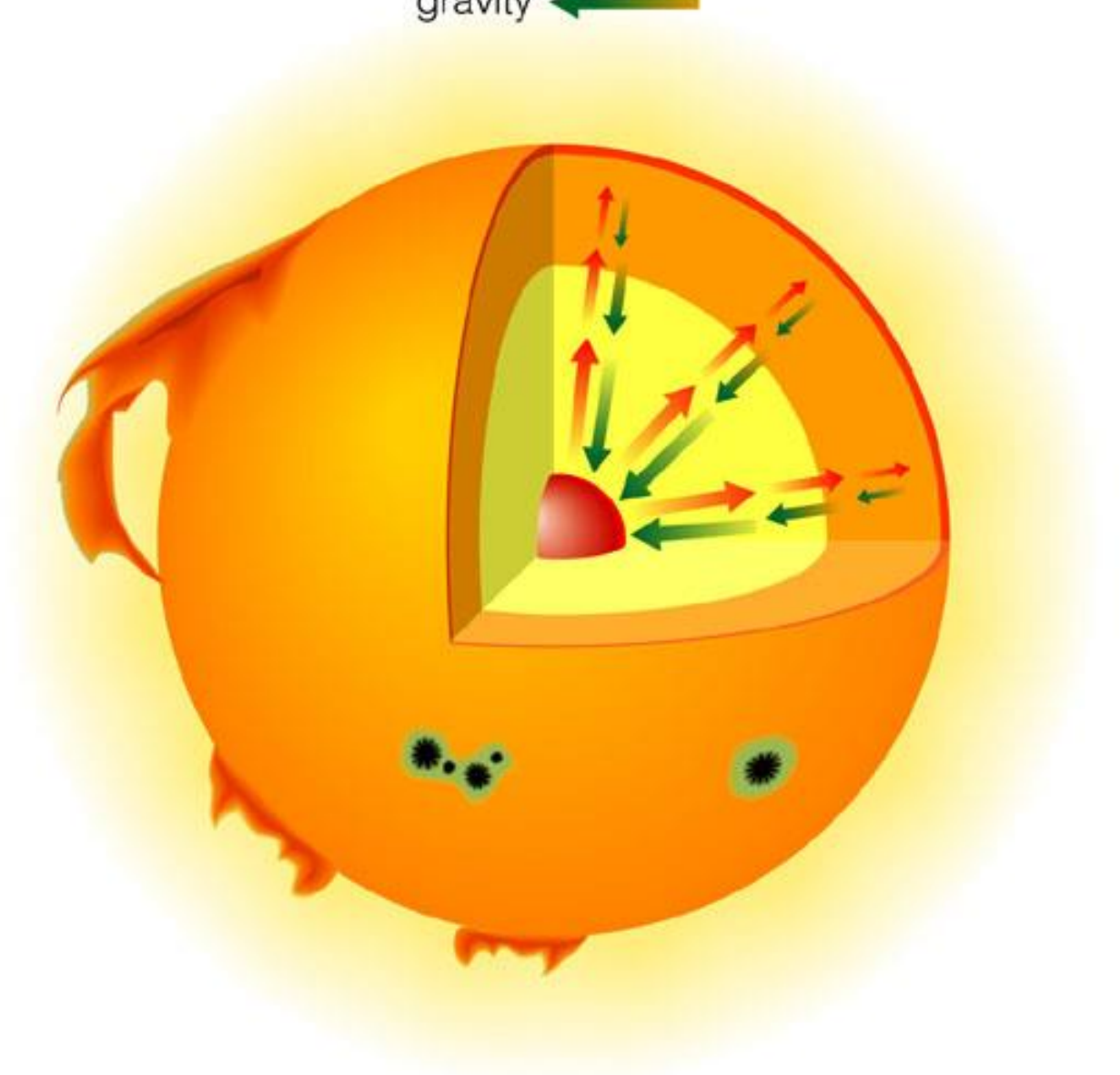
Coronal Hole

Prominence

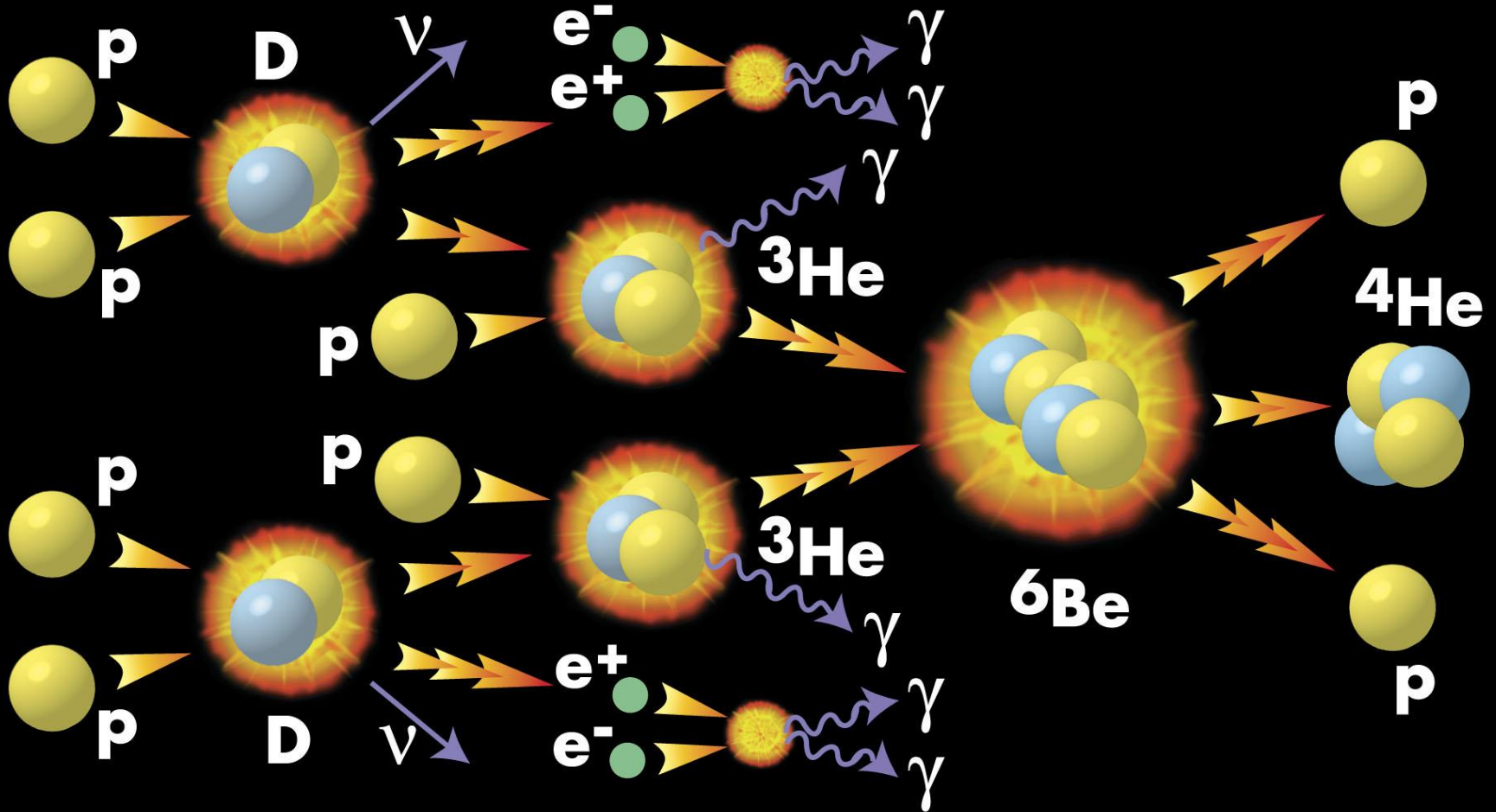


Zašto su zvijezde dugo
vremena iste veličine?

pressure →
gravity ←

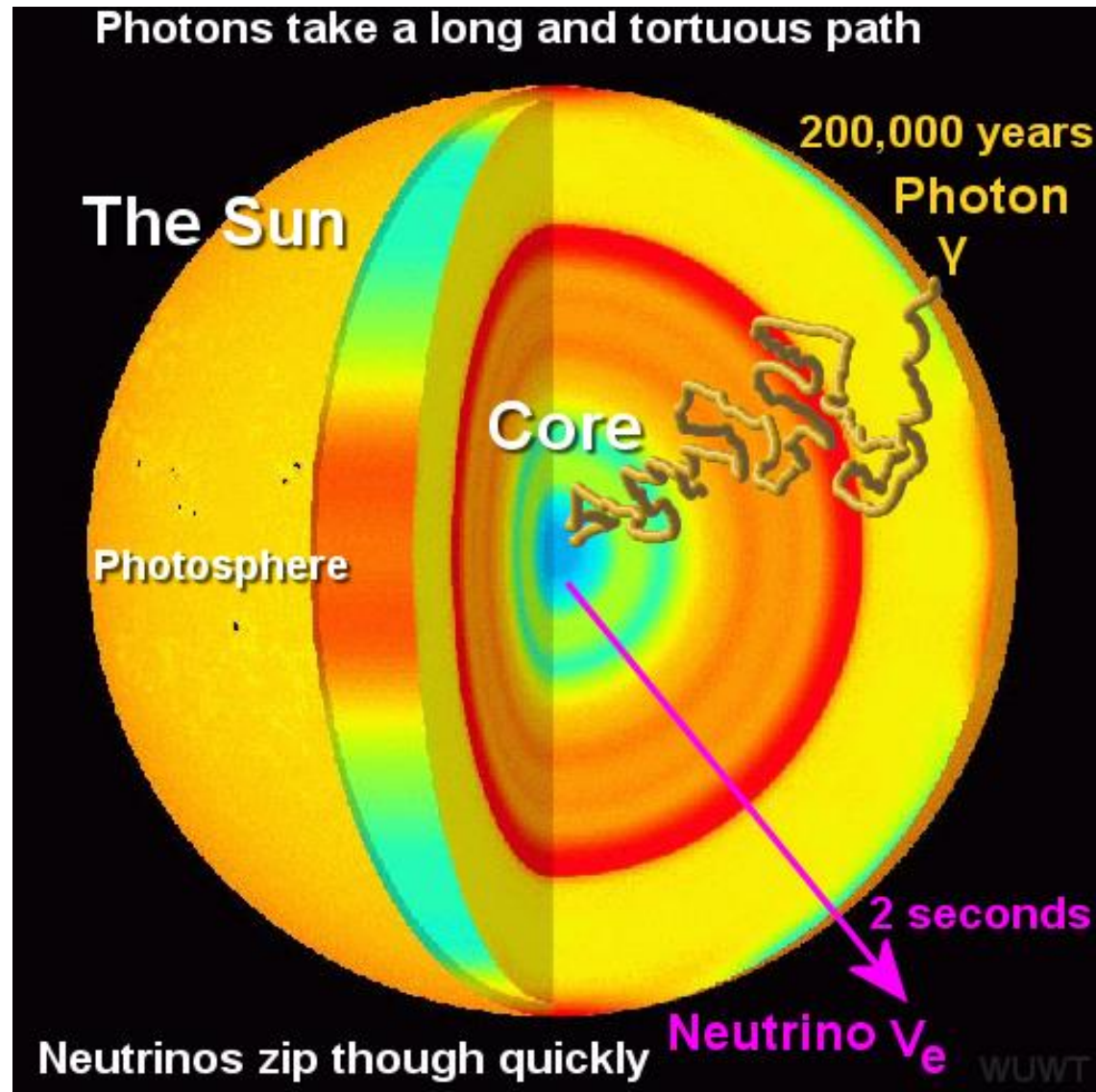


Kako zvijezde proizvode energiju?



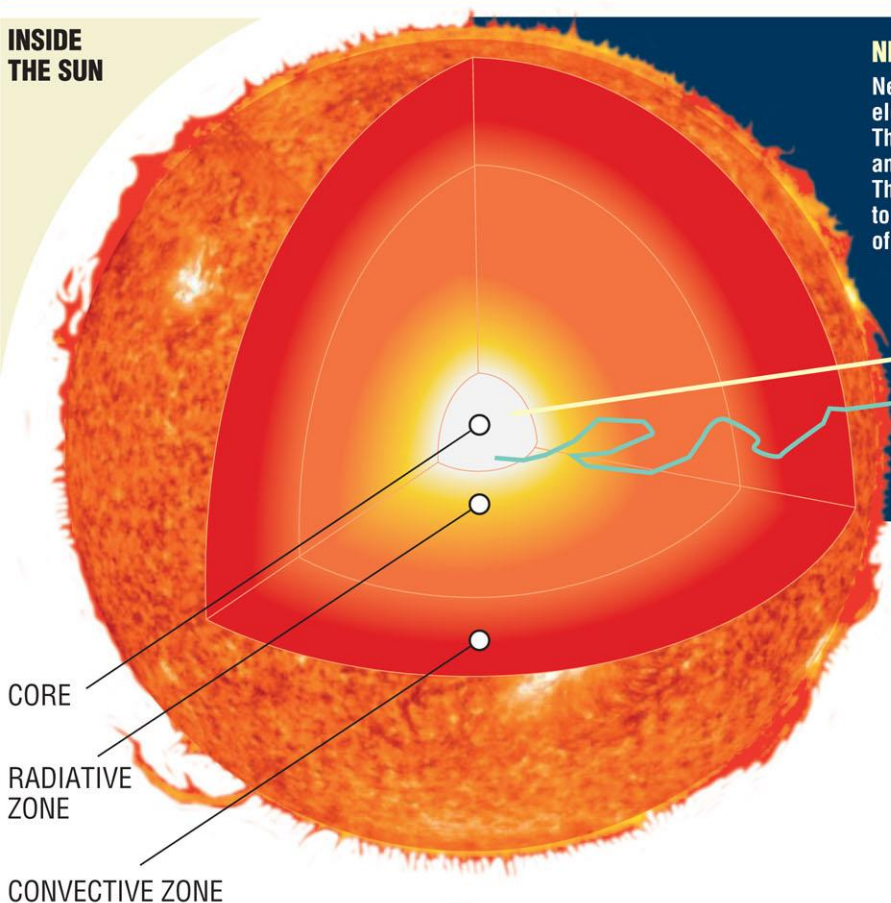
Copyright © 2010 Contemporary Physics Education Project

Sunčevi neutrini



THE SUN AS BOREXINO SEES IT IN REAL TIME

INSIDE THE SUN



NEUTRINOS

Neutrinos are particles with no electric charge and a tiny mass. They rarely interact with matter and may cross it undisturbed. That's why they take 8 minutes to get there from the core of the Sun to the Earth.

PHOTONS

The radiation studied so far is made up of photons, which interact with solar matter. It takes about 100.000 years for it to reach the Sun's surface and reach Earth.

8 minutes

100.000 years



Gran Sasso mountain

Gran Sasso

1,4 km of rock

LNGS
Laboratori Nazionali
del Gran Sasso

Borexino

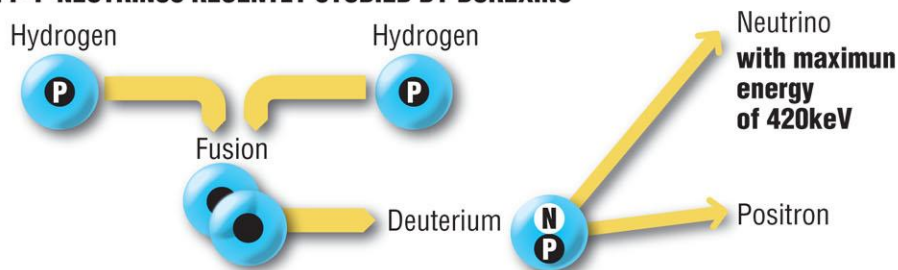
By analyzing P-P neutrino emission, Borexino has shown that the energy produced today in the Sun's core is equal to that produced 100.000 years ago.

CORE

RADIATIVE ZONE

CONVECTIVE ZONE

THE THERMONUCLEAR FUSION REACTION THAT PRODUCES THE P-P NEUTRINOS RECENTLY STUDIED BY BOREXINO



THE BOREXINO DETECTOR: HOW IT WORKS

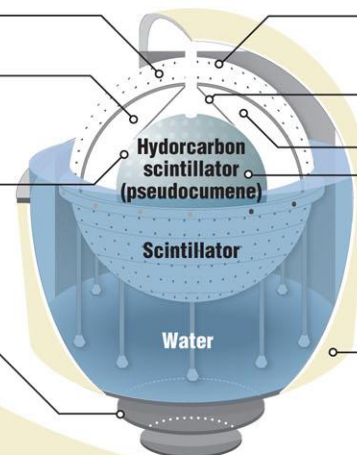
Stainless steel sphere
13,7 m diameter

Thin nylon film
(radon gas barrier)

Nylon sphere
8,5 m diameter

Shielding
steel dishes

Borexino displays a russian doll structure. Surrounded by 2.400 tons of highly purified water, a stainless steel sphere contains 1.000 tons of a liquid hydrocarbon (pseudocumene). At its center, within a smaller nylon sphere, are 300 tons of scintillating liquid.



Muons detector:
200 photomultiplier tubes
(facing outwards)

Vessel retention ropes

2.200 photomultiplier tubes
(facing inwards)

300 tons
organic liquid scintillator

Stainless steel
water tank
18 m diameter

Within this innermost sphere neutrinos interact with the liquid scintillator producing small flashes of light.

The photomultiplier tubes, acting as ultra-sensitive artificial eyes, detect and record the light flashes produced by the neutrinos.

Borexino observes dozens of these signals every day.

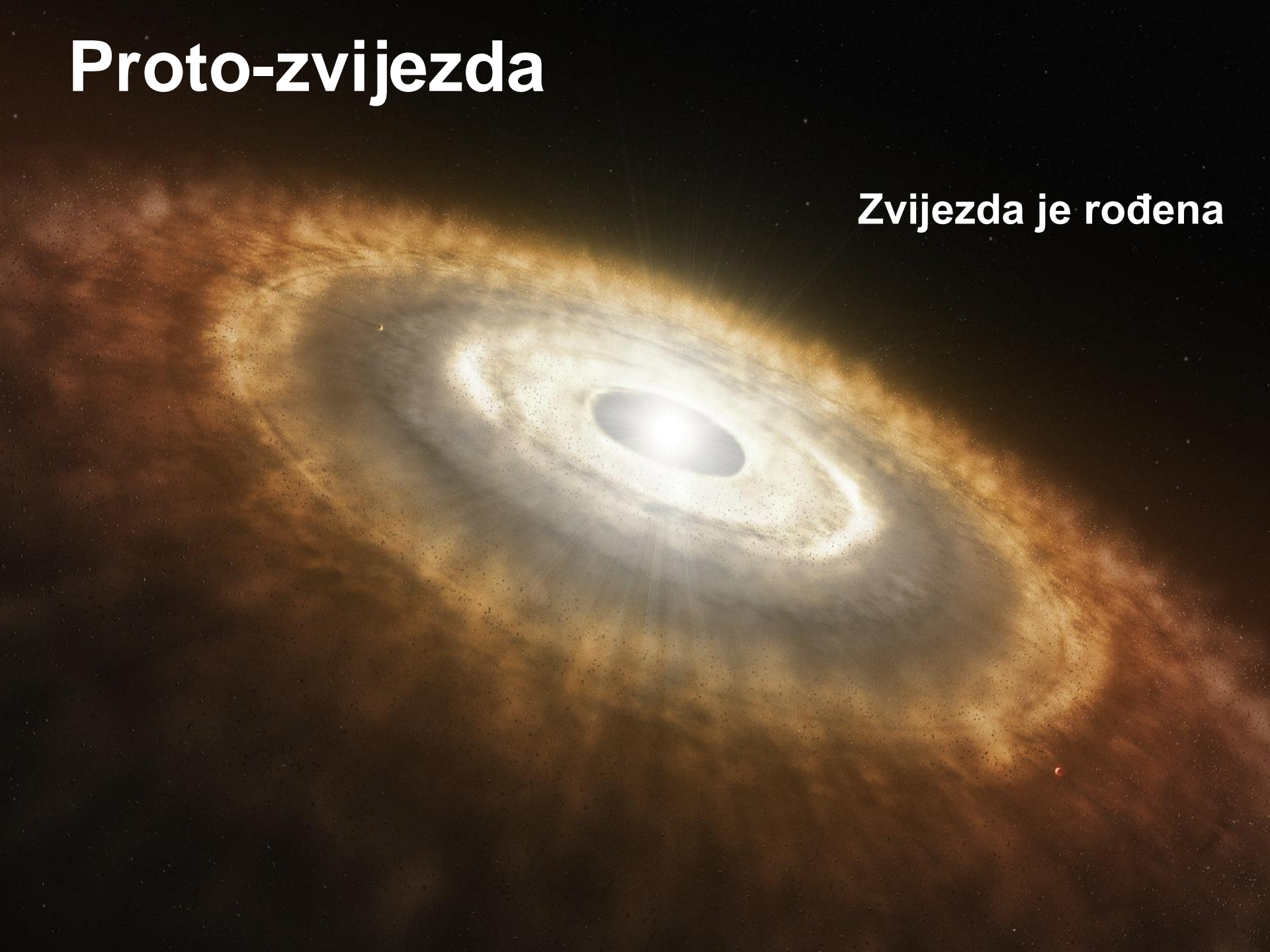


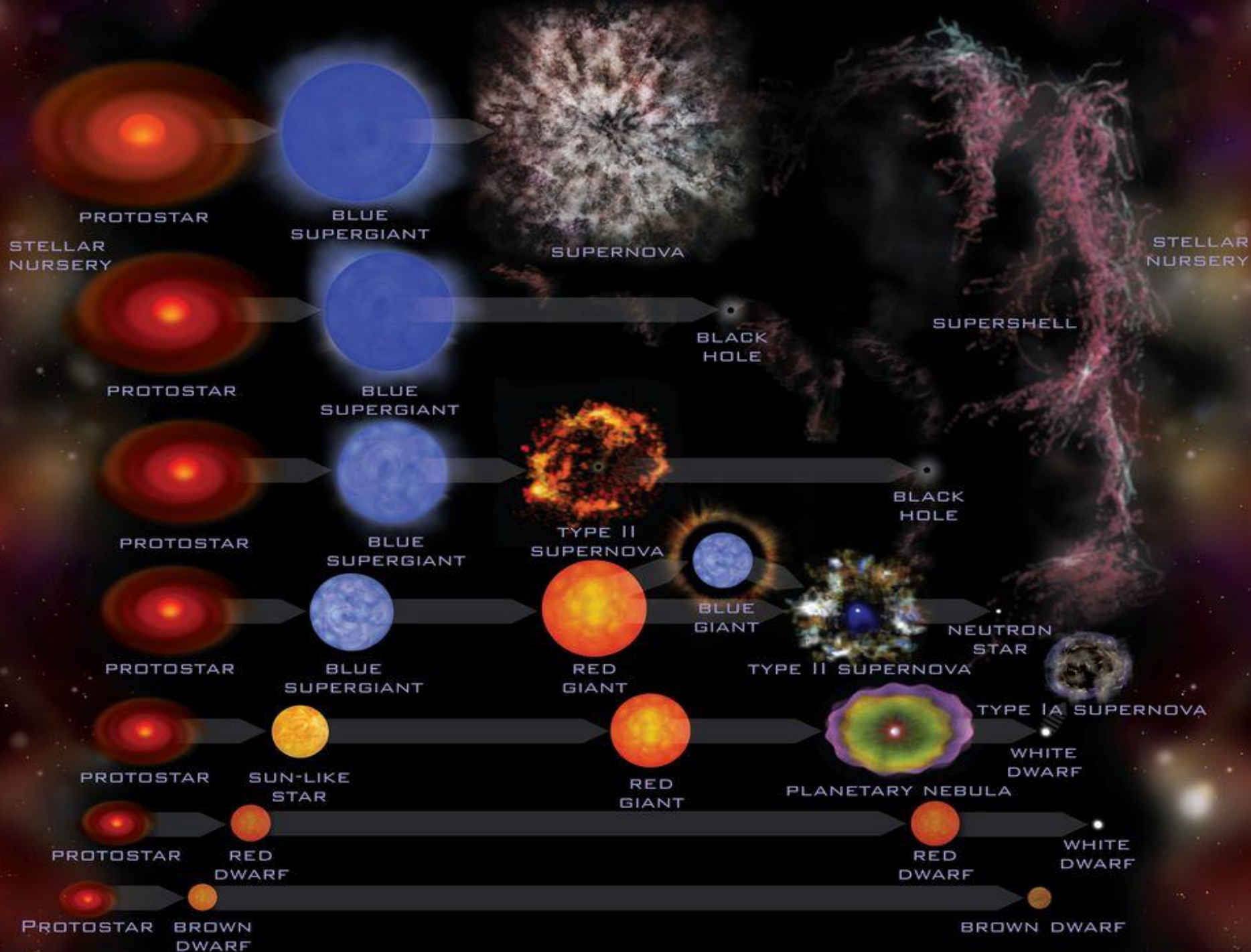
centimetri

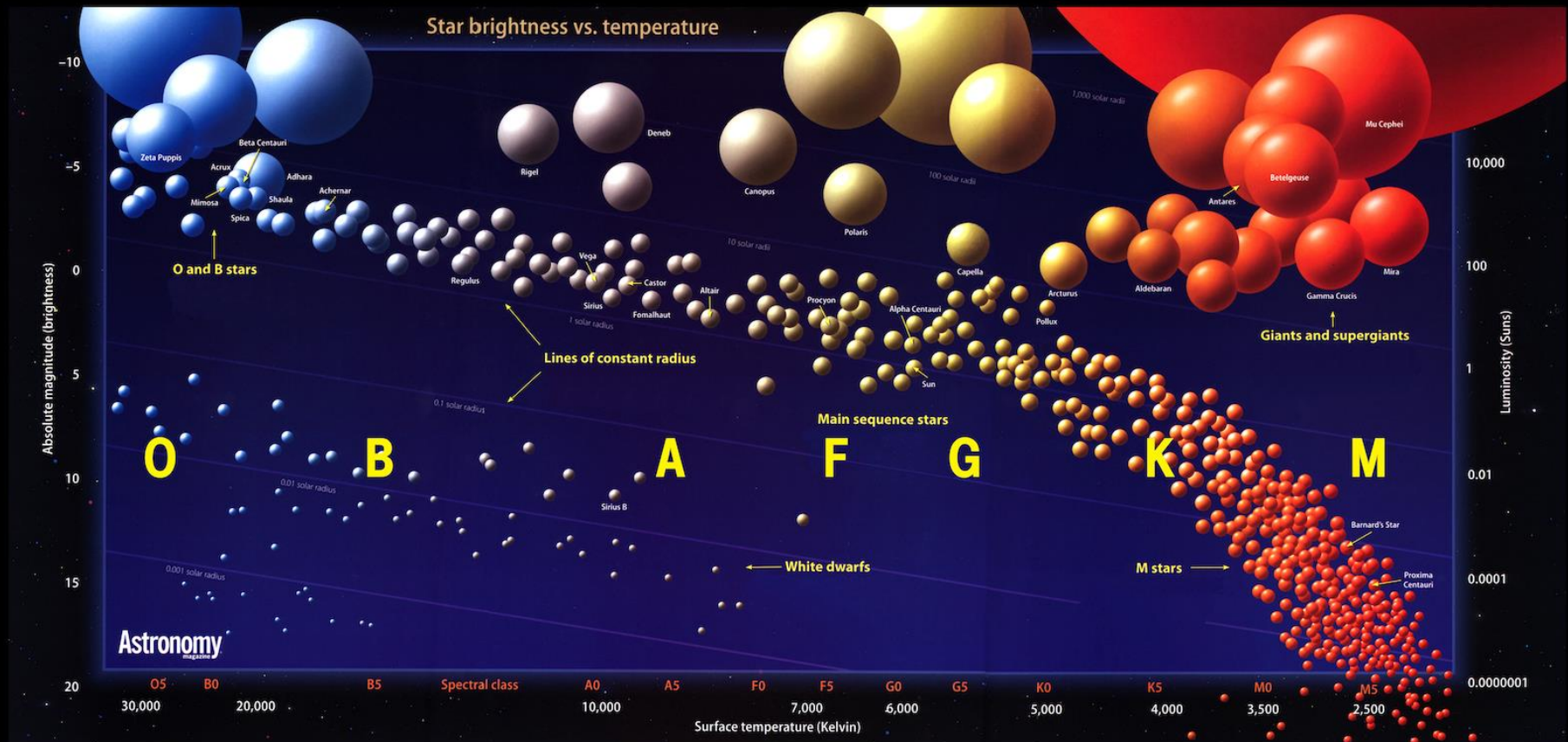
Kakva je budućnost zvijezda?

Proto-zvijezda

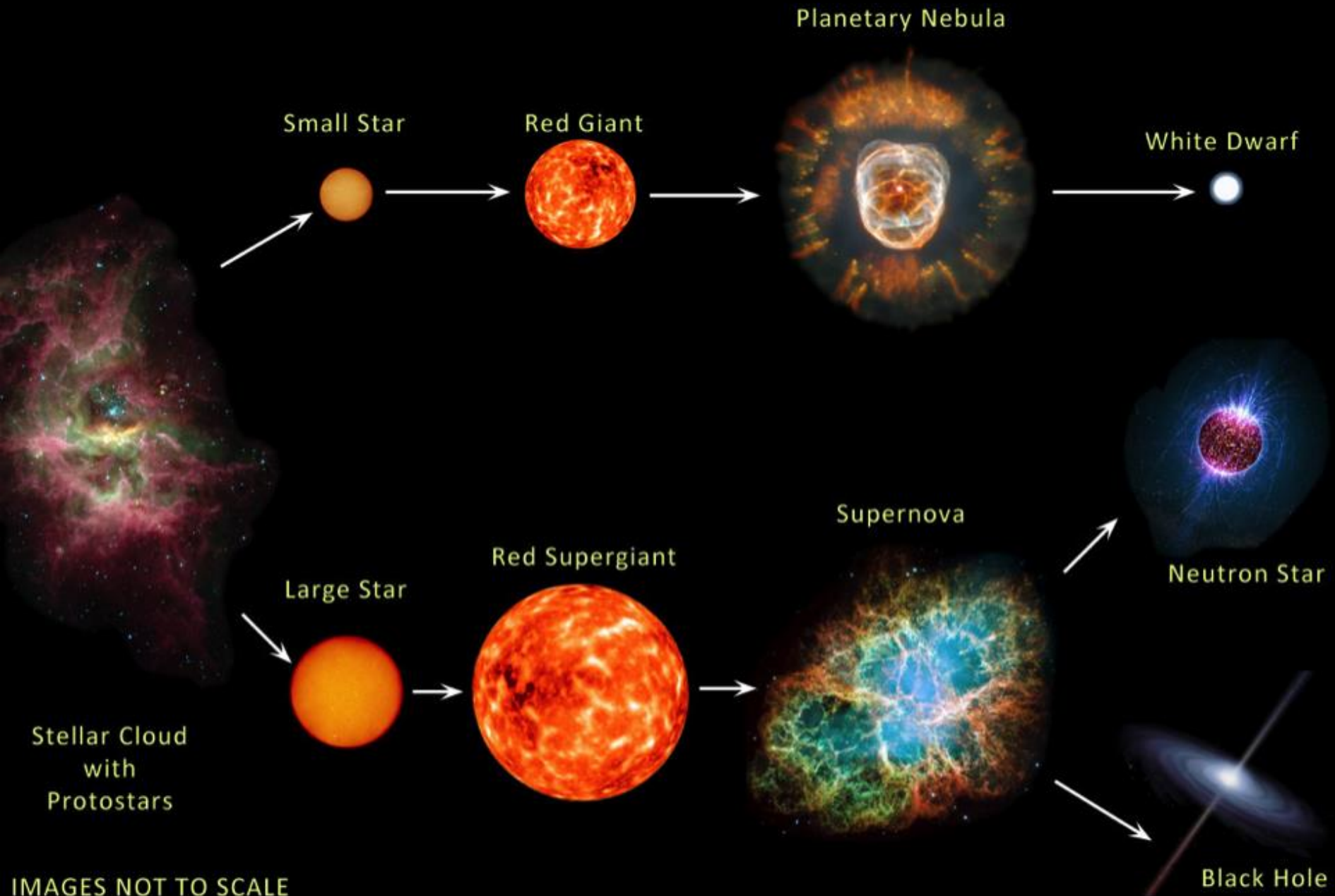
Zvijezda je rođena

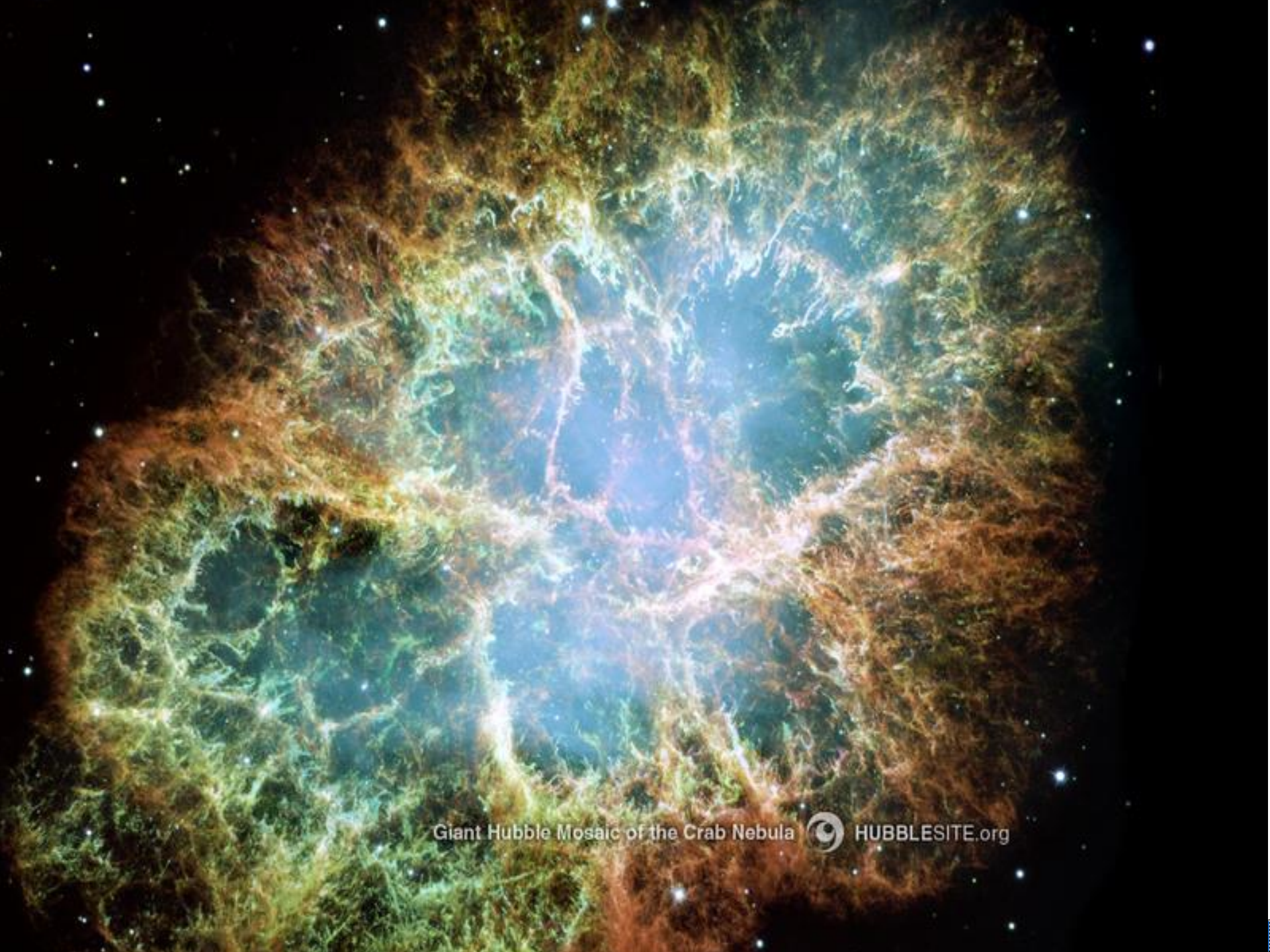






EVOLUTION OF STARS

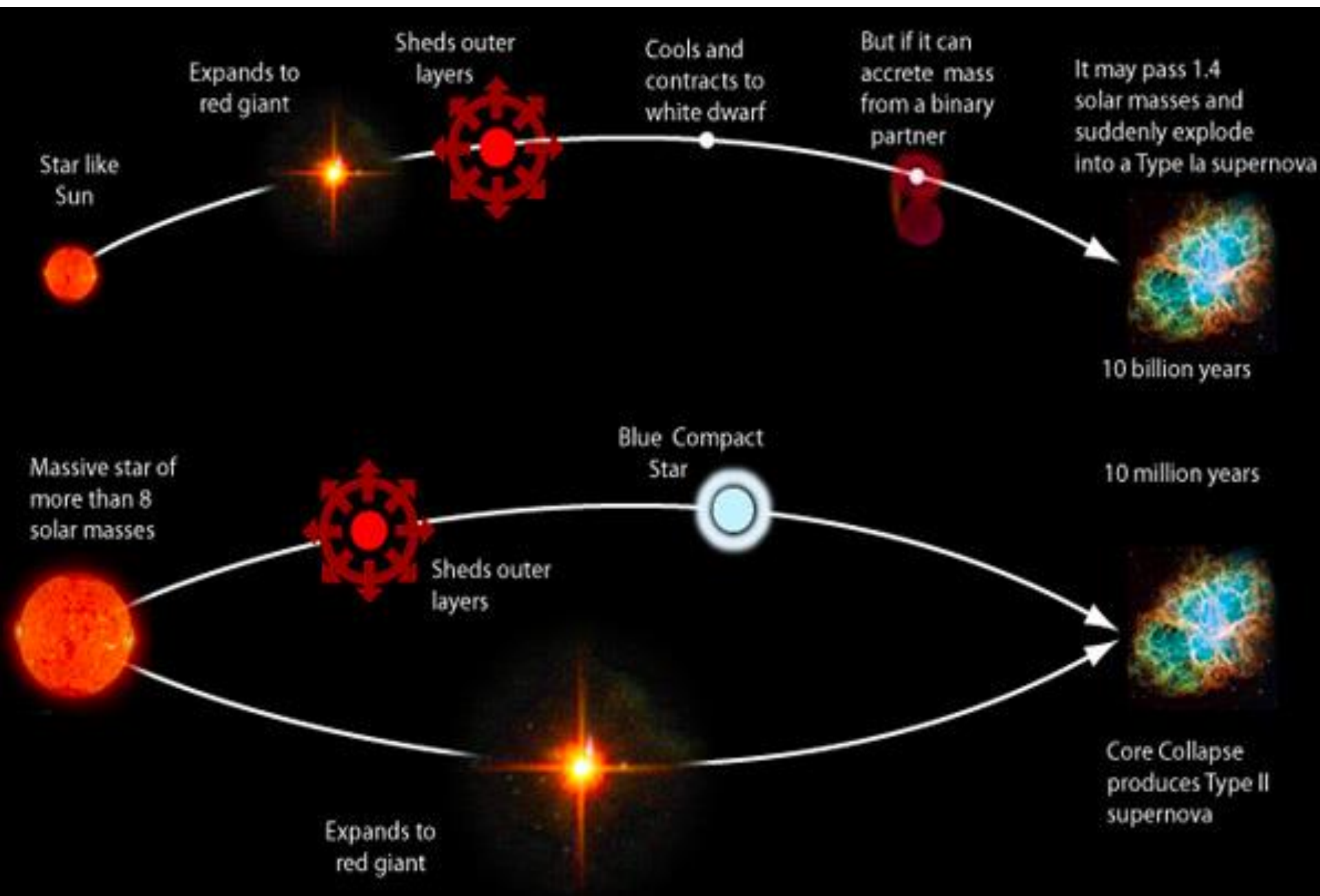


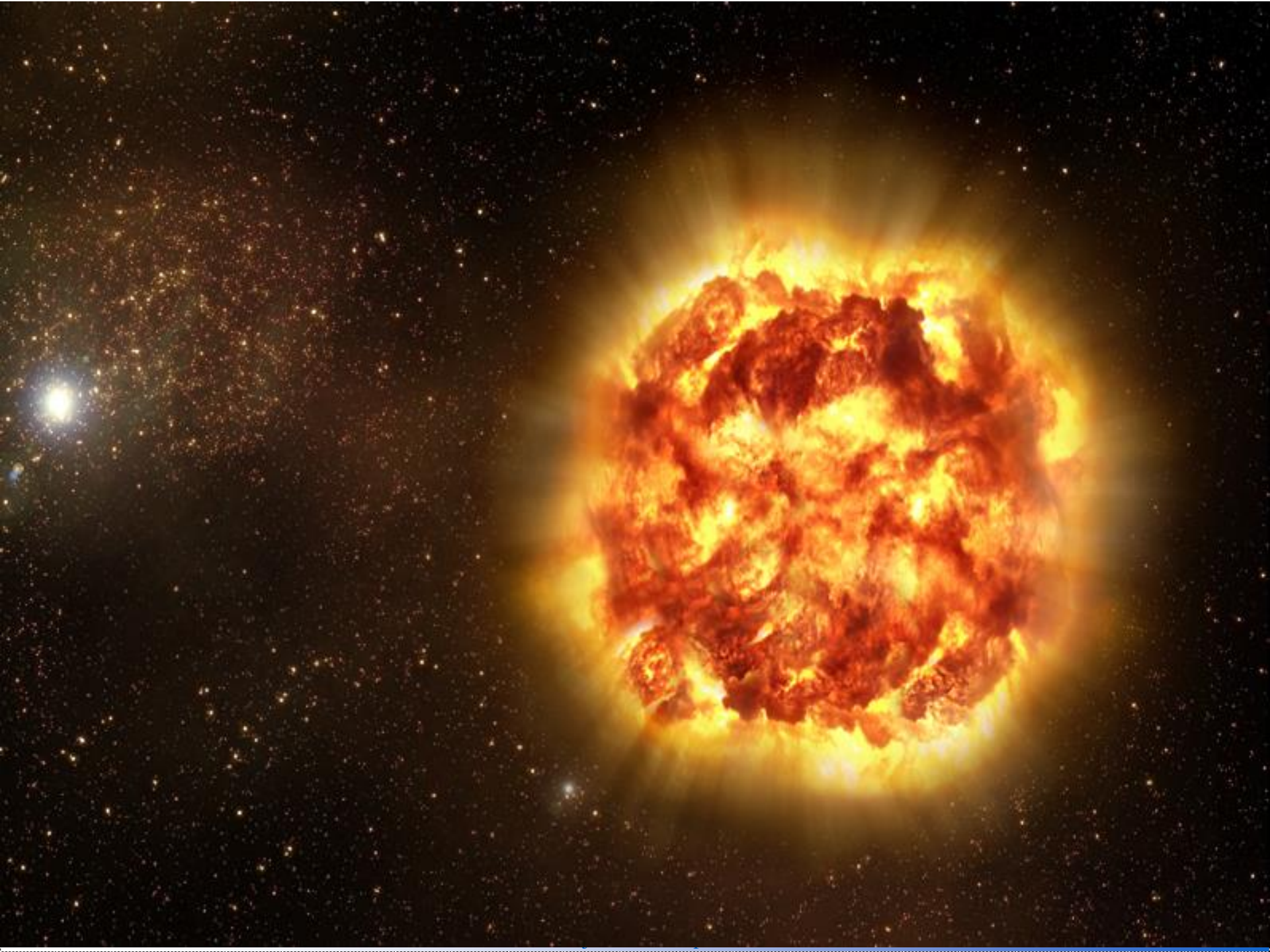


Giant Hubble Mosaic of the Crab Nebula



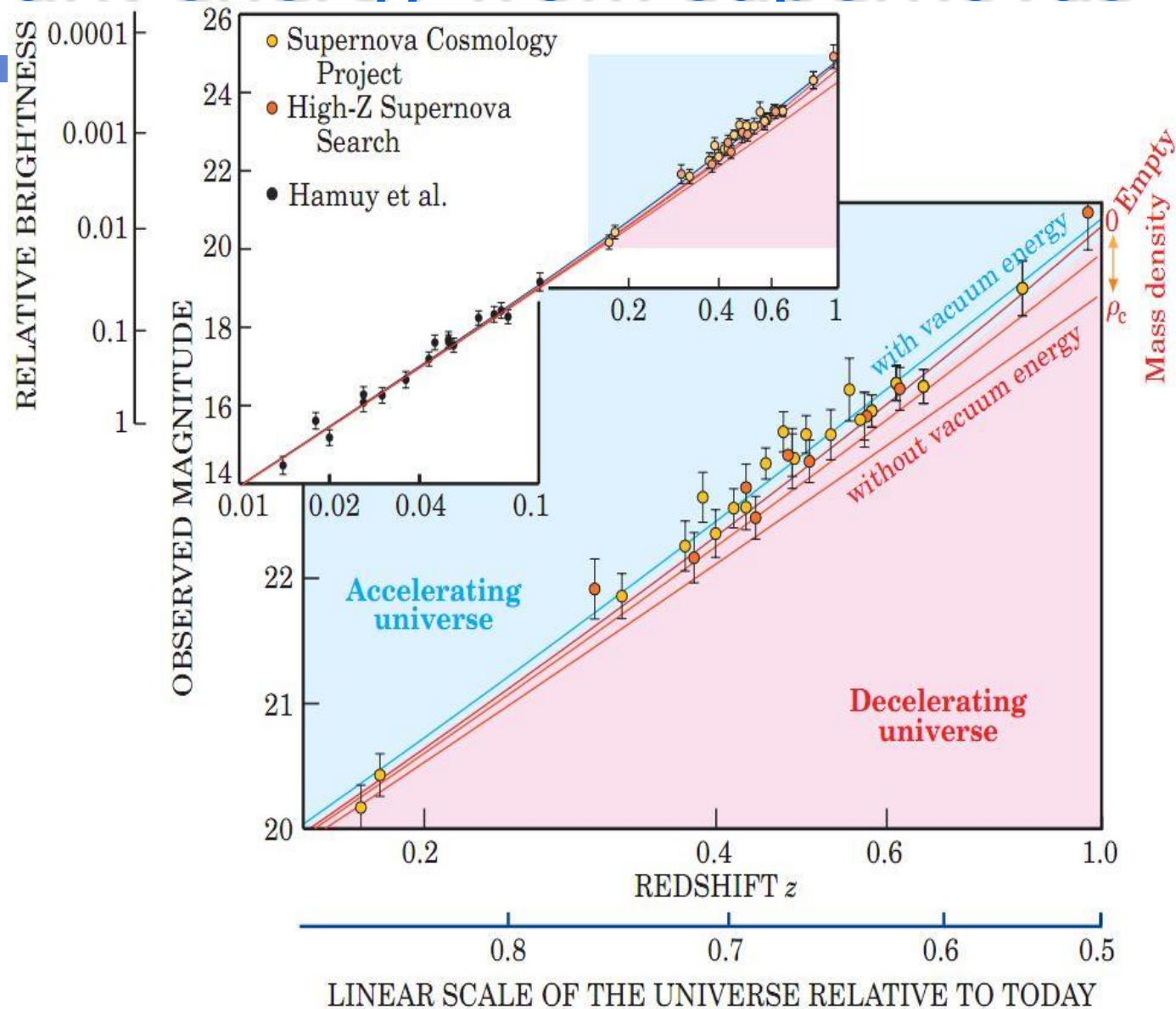
HUBBLESITE.org



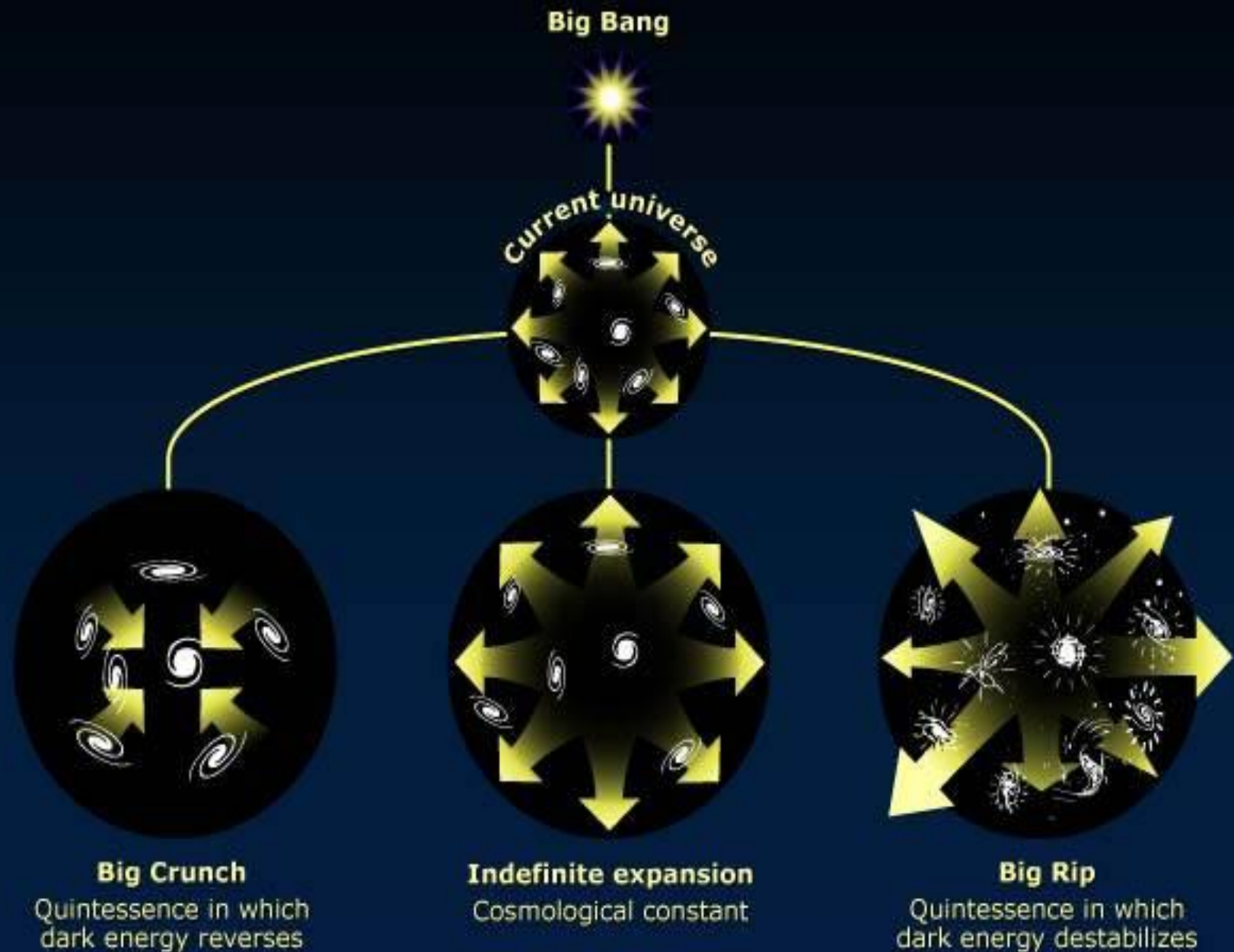




Dark energy from supernovas



Future fates of the dark-energy universe



SCALE OF THE UNIVERSE

BIG BANG

DECELERATION

ACCELERATION

BIG RIP

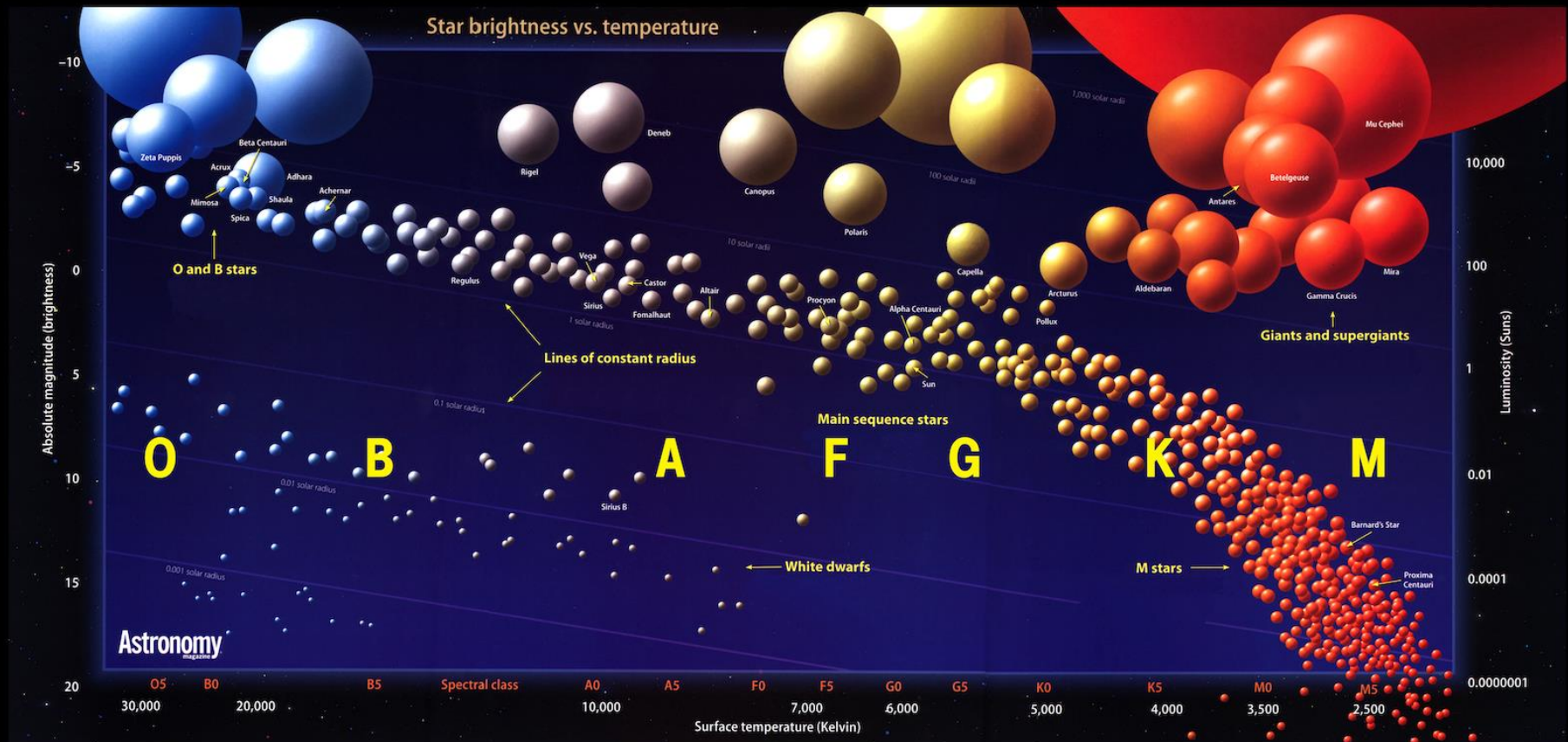
CONSTANT DARK ENERGY

BIG CRUNCH

PRESENT

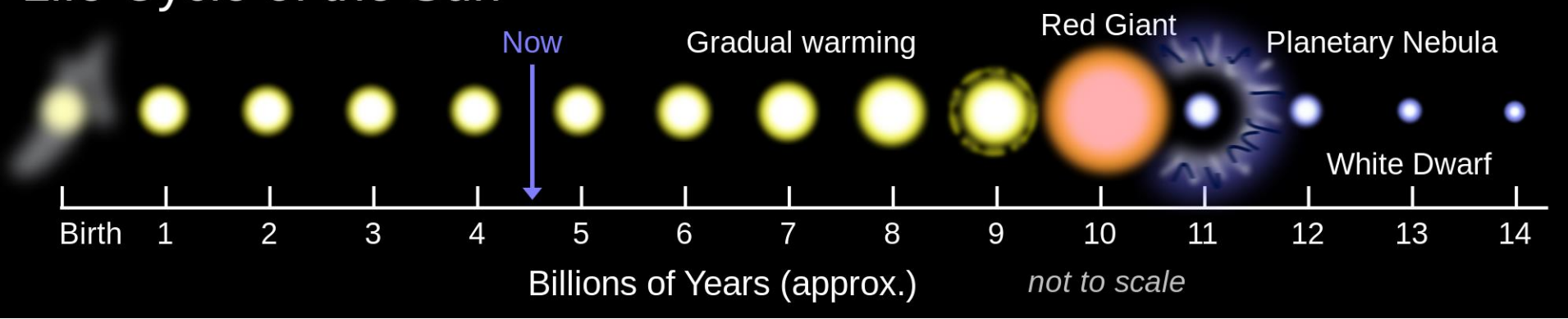
FUTURE

TIME

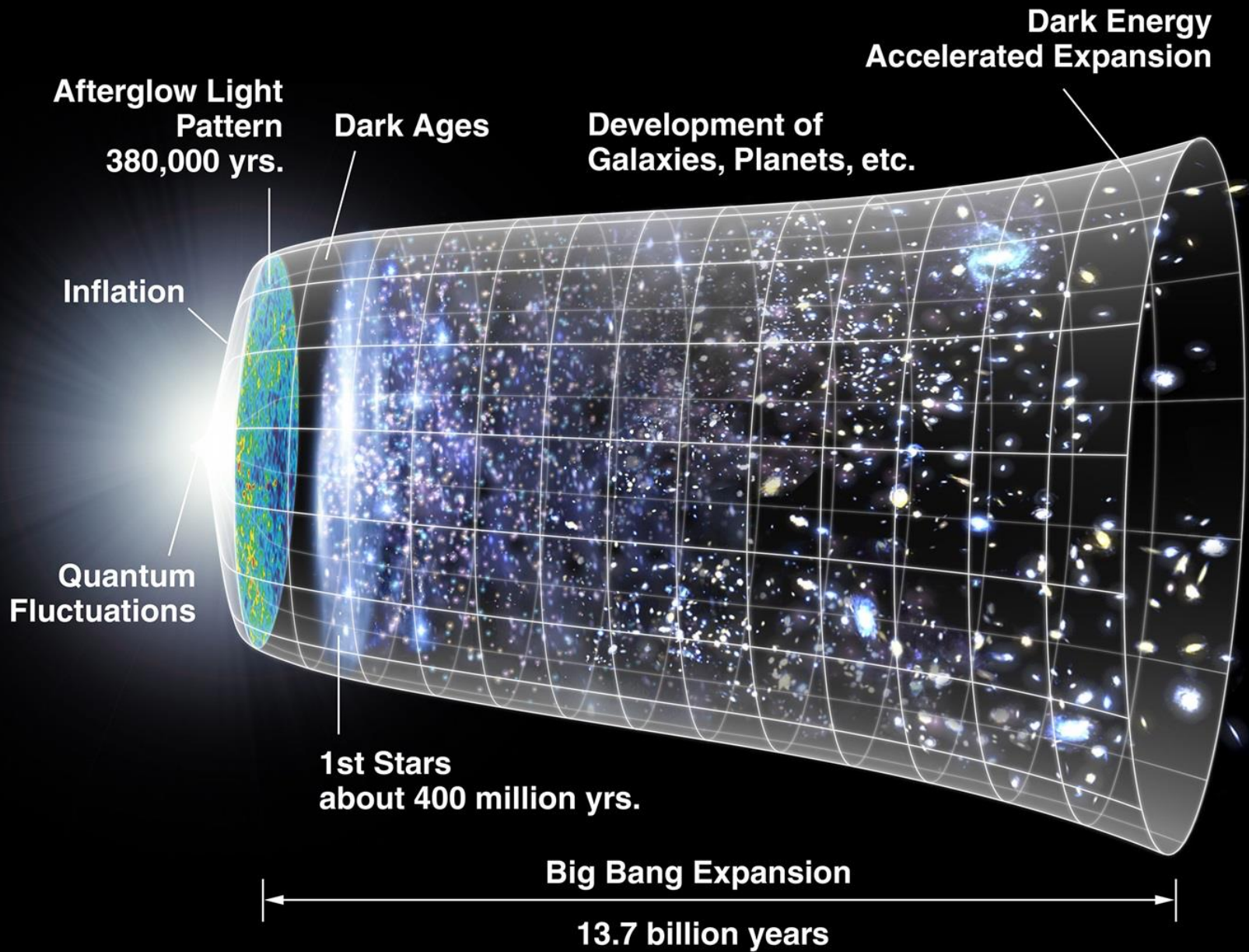




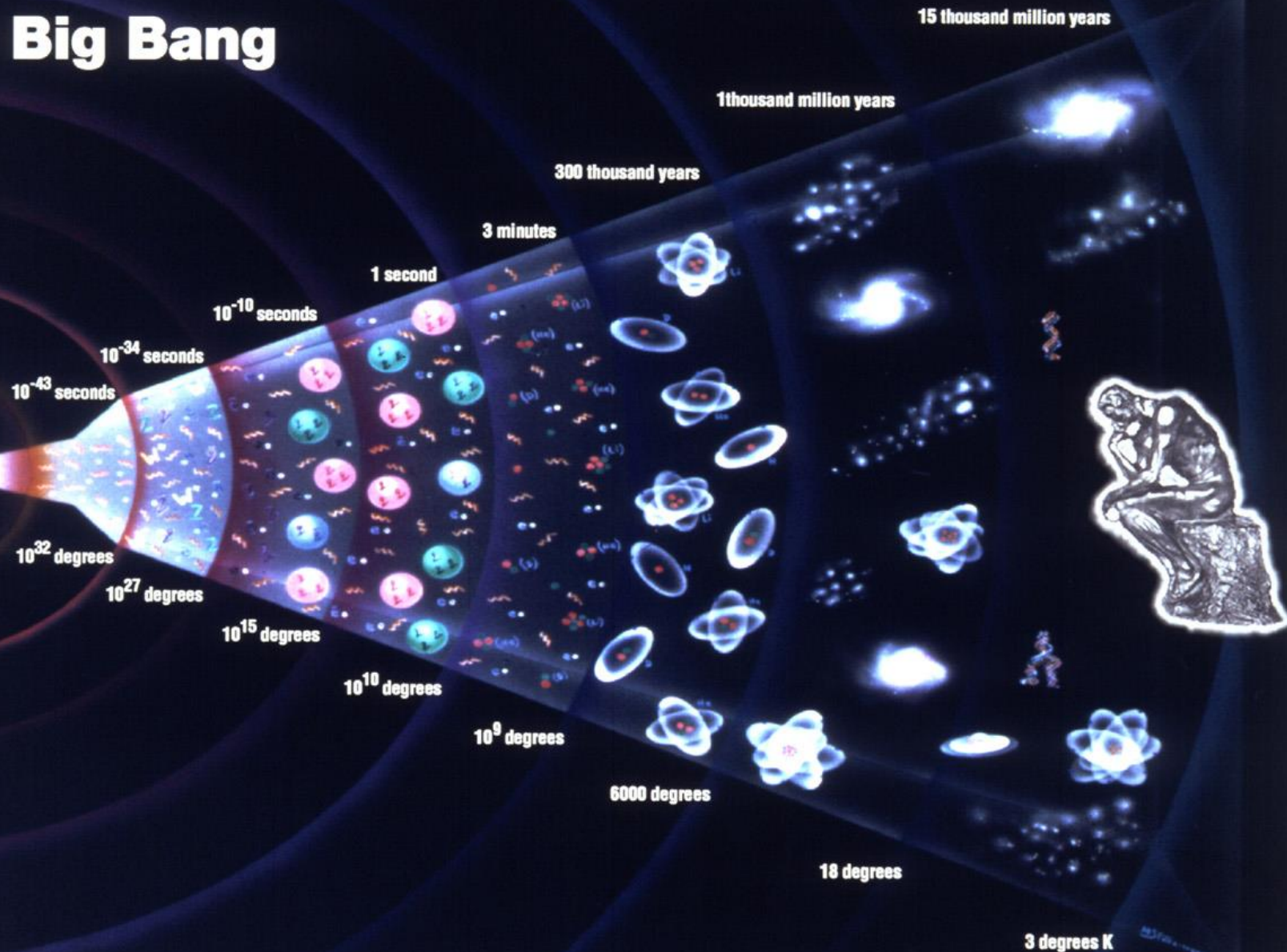
Life Cycle of the Sun

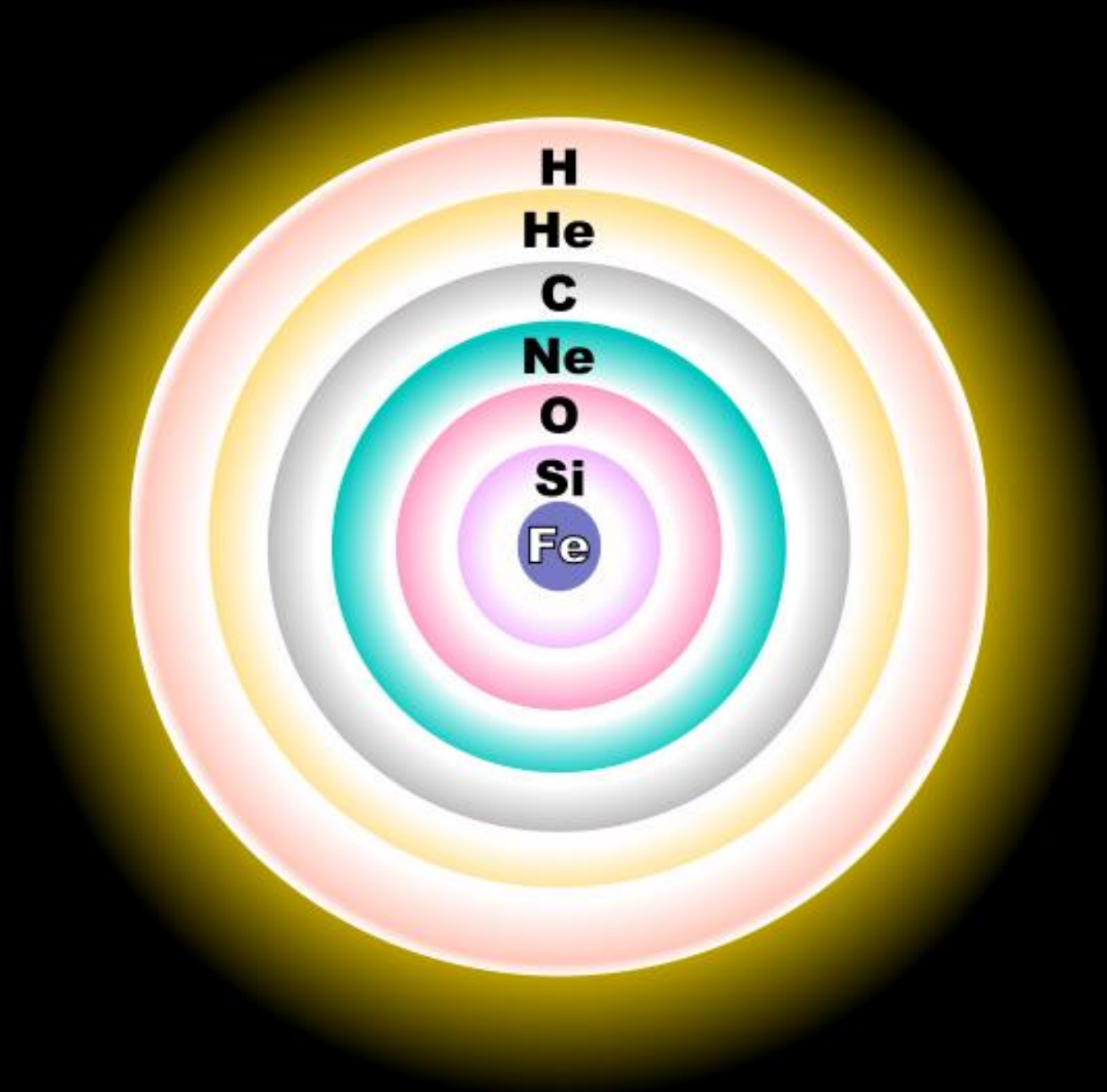


Odakle atomi u svemiru?



Big Bang





H

He

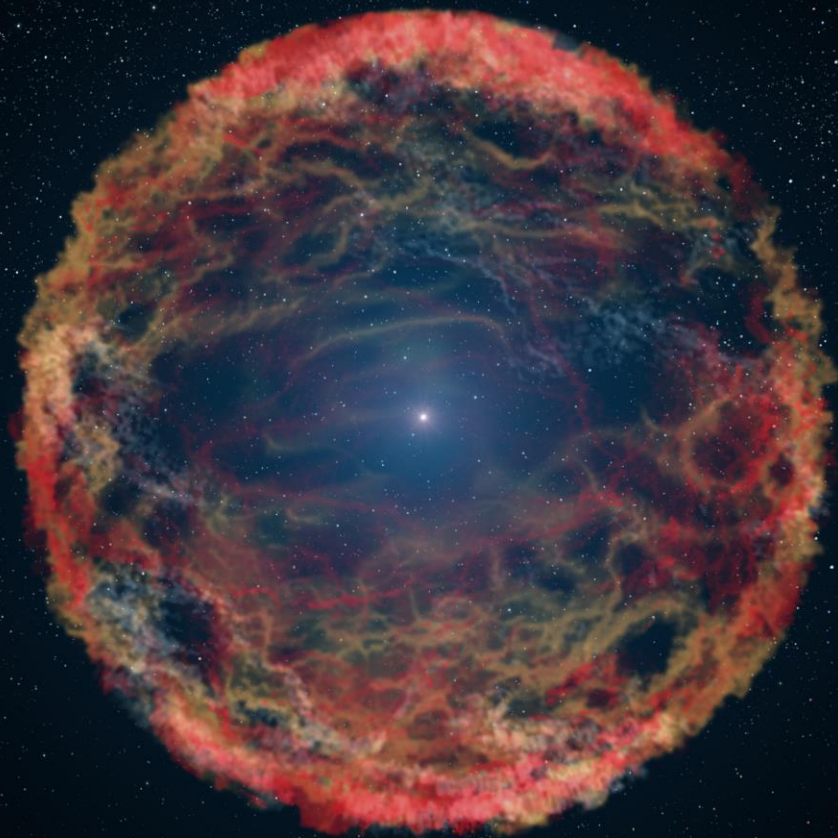
C

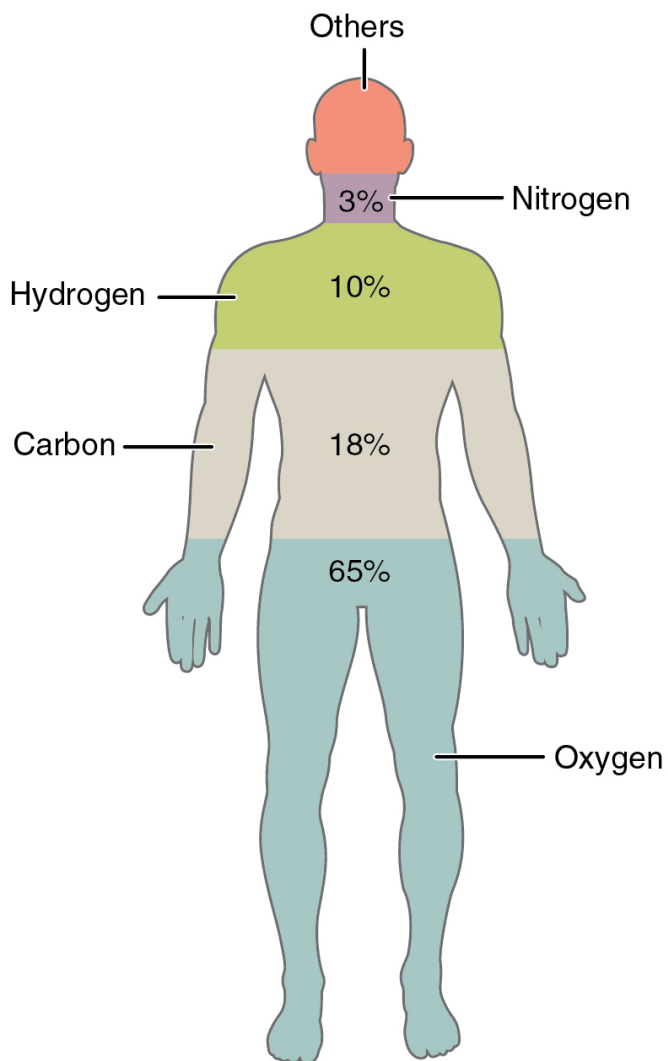
Ne

O

Si

Fe





Element	Symbol	Percentage in Body
Oxygen	O	65.0
Carbon	C	18.5
Hydrogen	H	9.5
Nitrogen	N	3.2
Calcium	Ca	1.5
Phosphorus	P	1.0
Potassium	K	0.4
Sulfur	S	0.3
Sodium	Na	0.2
Chlorine	Cl	0.2
Magnesium	Mg	0.1
Trace elements include boron (B), chromium (Cr), cobalt (Co), copper (Cu), fluorine (F), iodine (I), iron (Fe), manganese (Mn), molybdenum (Mo), selenium (Se), silicon (Si), tin (Sn), vanadium (V), and zinc (Zn).		less than 1.0



Ovo si ti 😊✎

