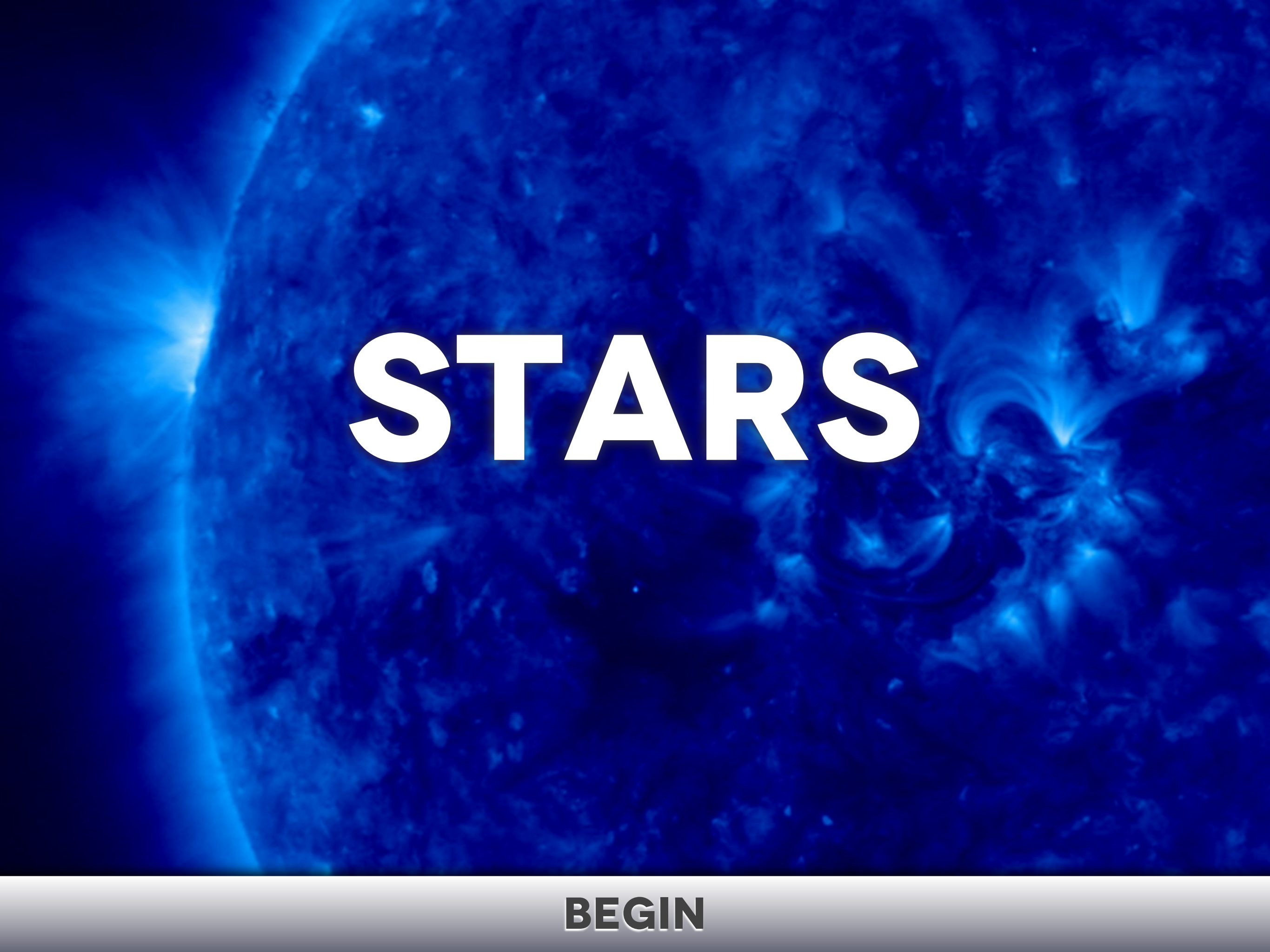


A vibrant blue nebula with swirling patterns and a bright light source on the left.

STARS

BEGIN

WHAT IS A STAR?

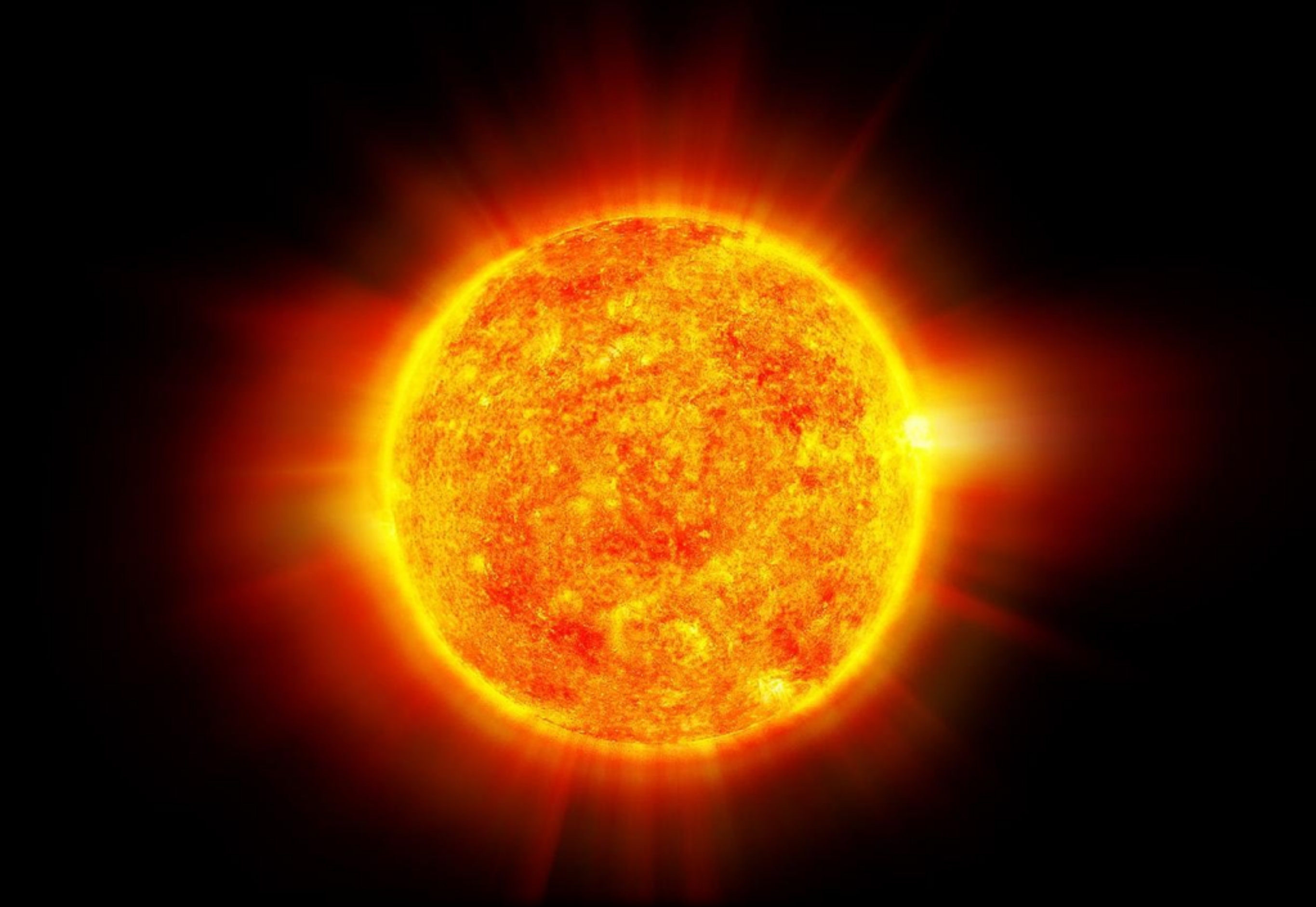


LAST

NEXT

WHAT IS A STAR?

A massive ball of gas
that creates and emits
it's own energy.



LAST

NEXT

HOW DO STARS CREATE ENERGY?



LAST

NEXT

HOW DO STARS CREATE ENERGY?

Stars produce energy through the process of nuclear fusion.

SO, WHAT IS NUCLEAR FUSION?

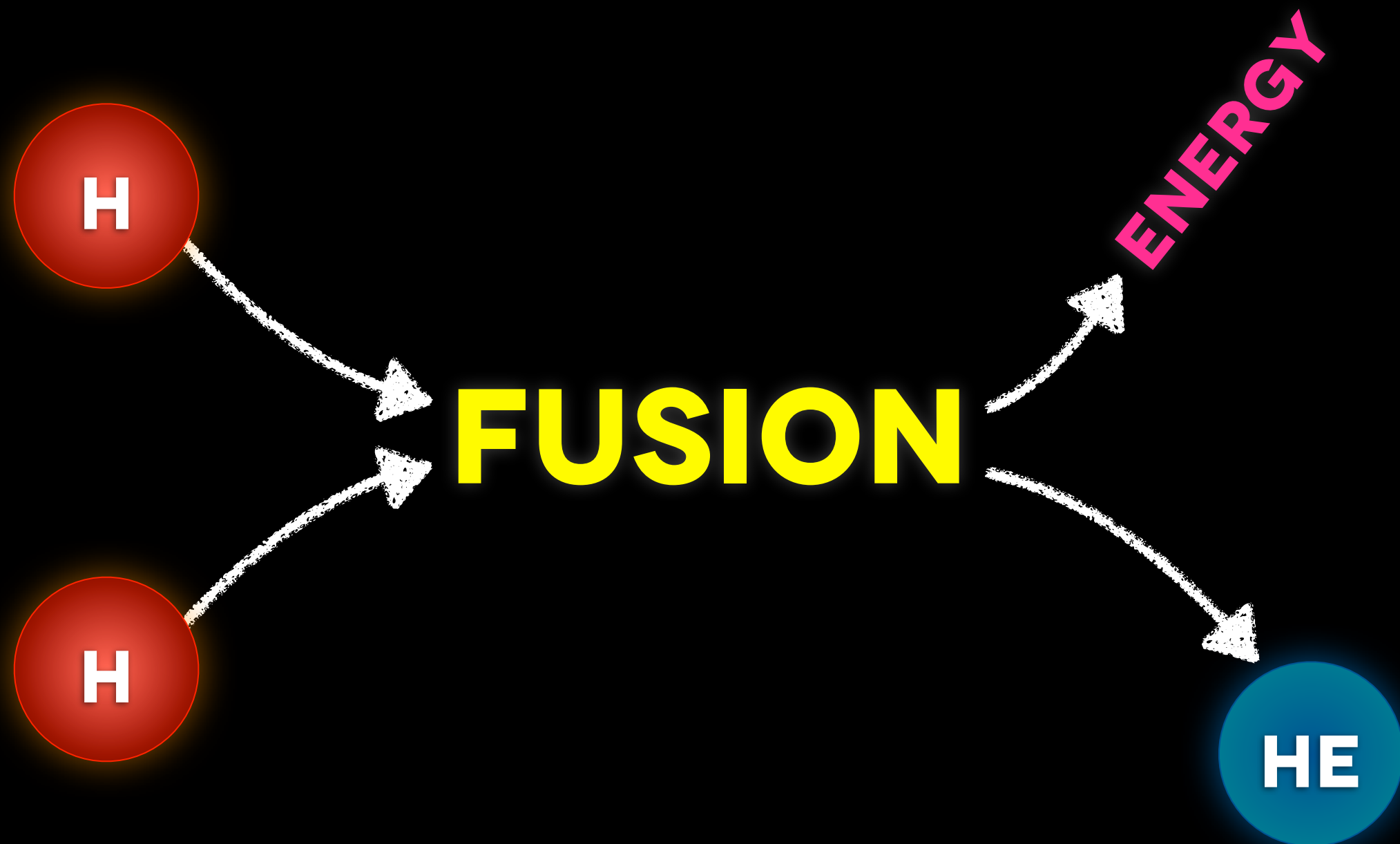
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[NEXT](#)

SO, WHAT IS NUCLEAR FUSION?

Nuclear fusion is a reaction in which atoms collide and fuse together to form a new element. In the process, huge amounts of energy are released.

SO, WHAT IS NUCLEAR FUSION?





The Sun produces so much energy, that every second the core releases the equivalent of 100 billion nuclear bombs.

HOW DO STARS FORM?

HOW DO STARS FORM?

1. Large clouds of dust and gas are pulled together by gravity (these clouds are called nebulae)



LAST

NEXT



LAST

NEXT



LAST

NEXT



LAST

NEXT

HOW DO STARS FORM?

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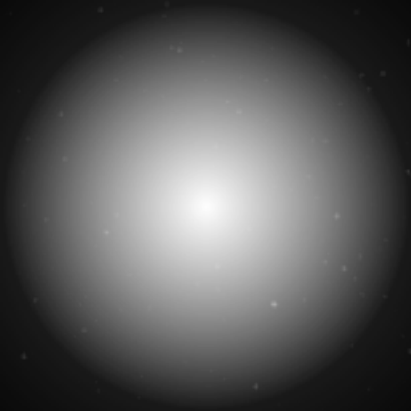
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5. Eventually when the hydrogen fuel becomes exhausted, the star expands greatly becoming a giant or a supergiant

MASS IS IMPORTANT

MASS IS IMPORTANT



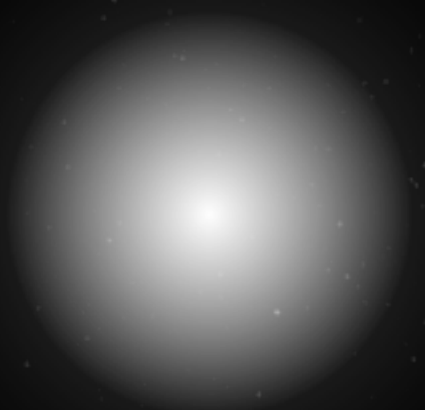
small stars

long life

cooler

quiet death

MASS IS IMPORTANT



small stars

long life

cooler

quiet death



large stars

short life

hotter

intense death



nebula

LAST

NEXT

main
sequence



SMALL

nebula

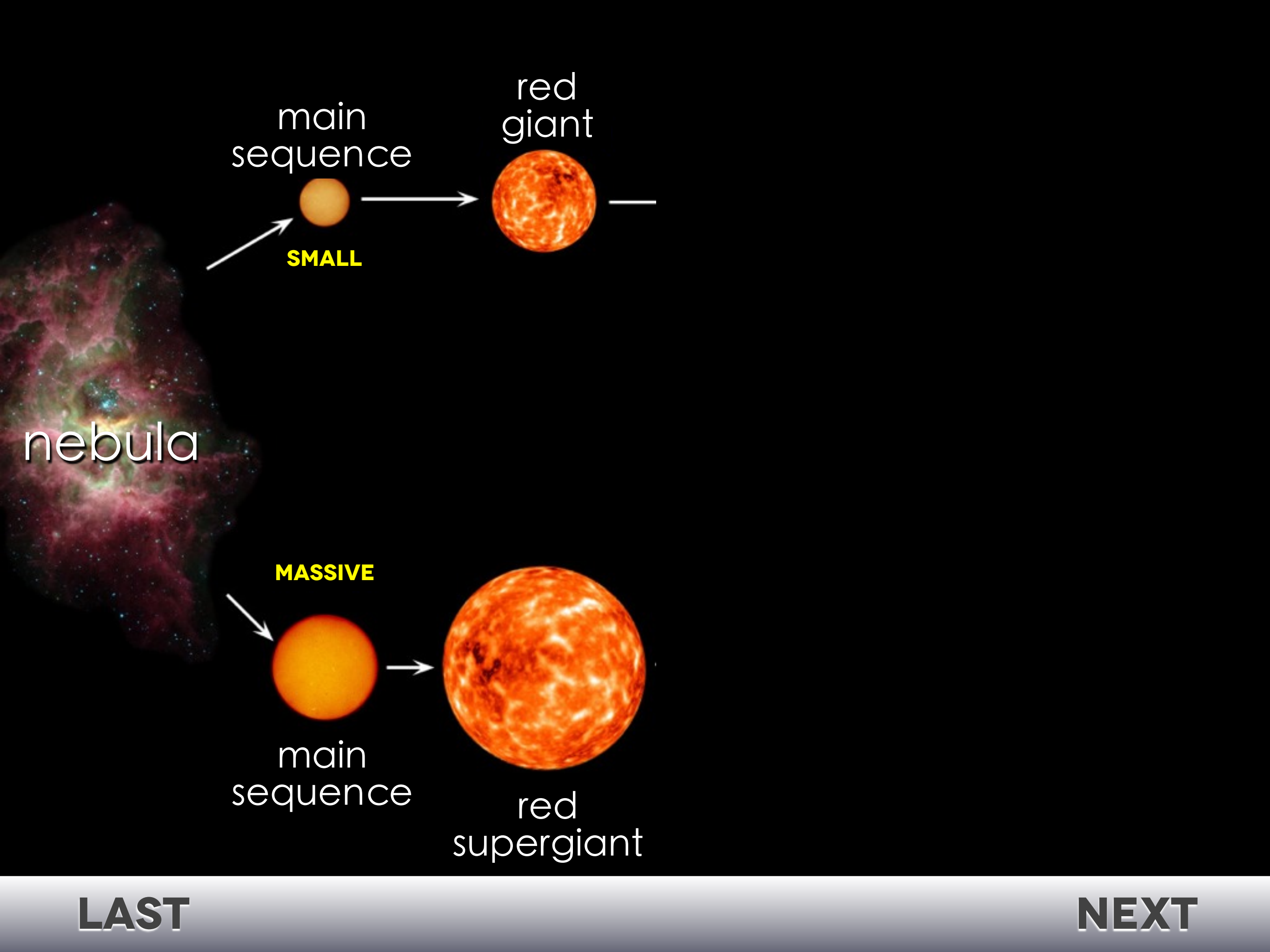
MASSIVE

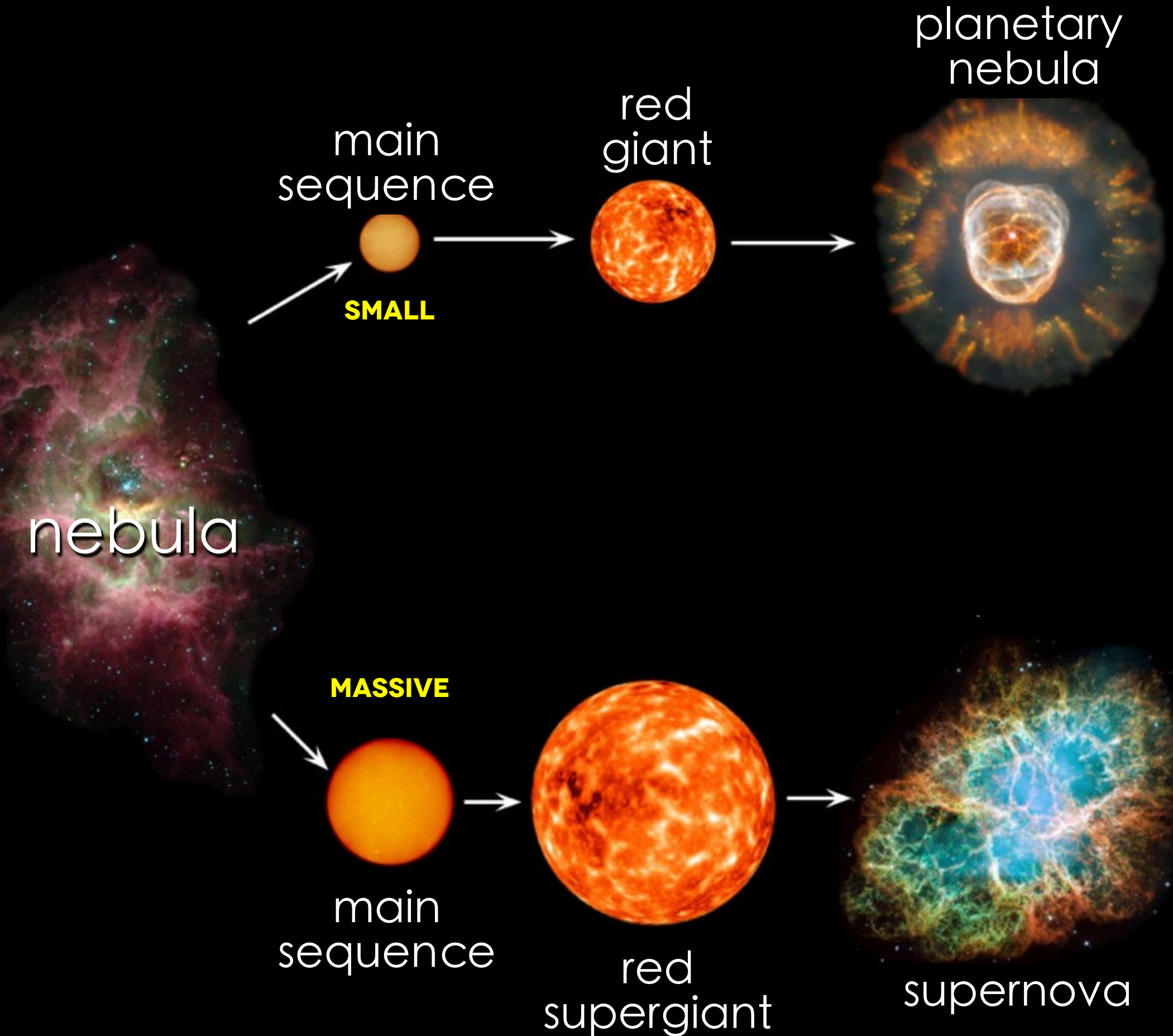


main
sequence

LAST

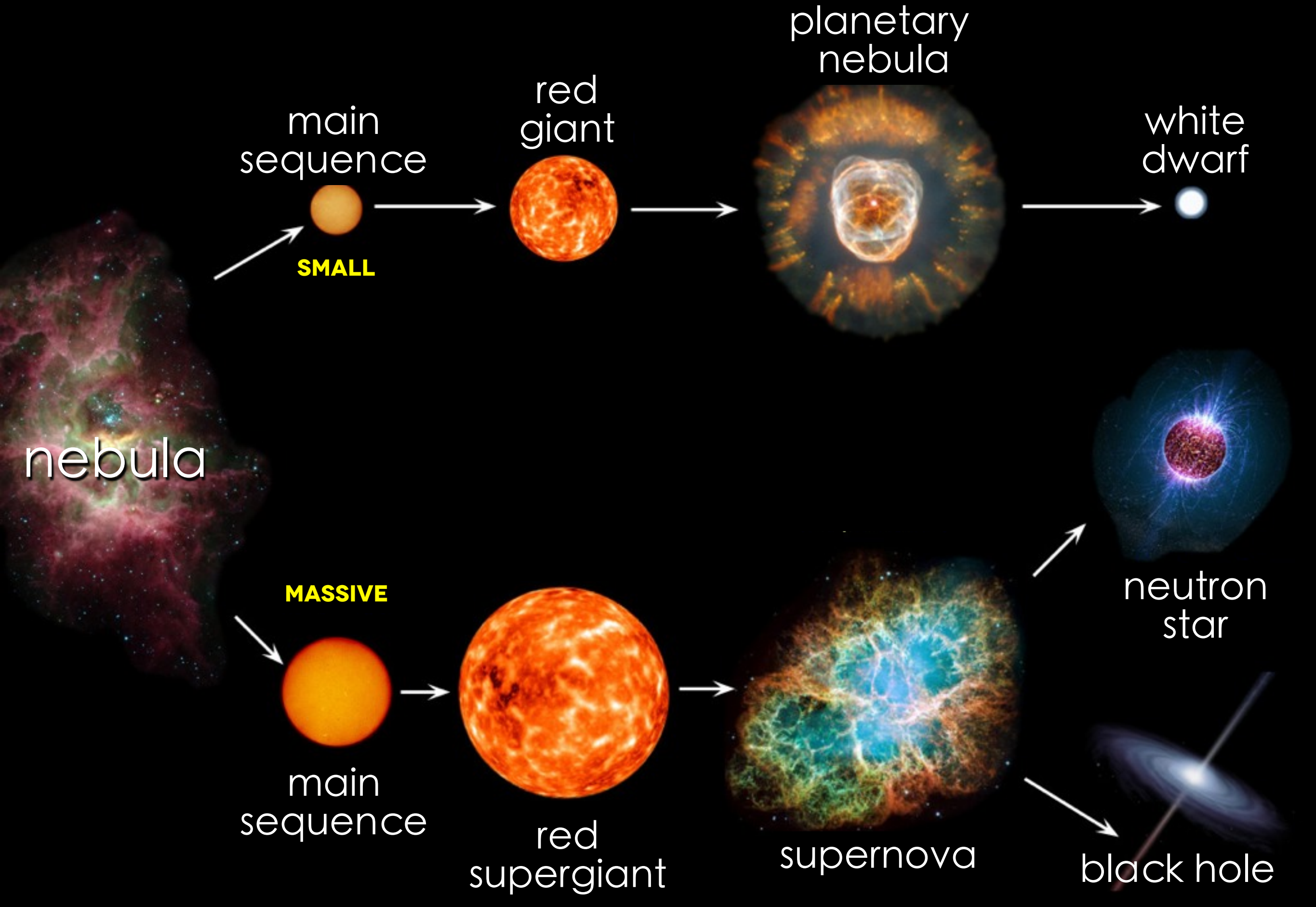
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LAST

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LAST

NEXT

A comparison of star sizes

Red Dwarf

Lower limit:
0.08 solar
masses

Our Sun

1 solar mass

Blue-white
Supergiant
150 solar masses

Red Giant

Very old stars that
evolve from stars of
<5 solar masses

LAST

NEXT



SO, WHAT'S “OUR STAR” LIKE?

LAST

NEXT

SO, WHAT'S “OUR STAR” LIKE?

- * Our star, the Sun, is an average sized, middle-aged, Main Sequence star.

SO, WHAT'S “OUR STAR” LIKE?

- * Our star, the Sun, is an average sized, middle-aged, Main Sequence star.
- * It formed, along with our solar system, 4.6 billion years ago.

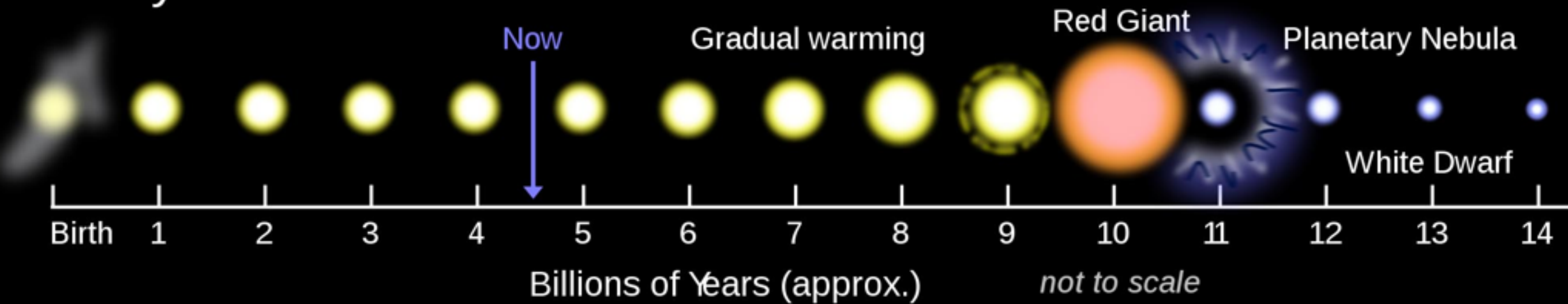
SO, WHAT'S “OUR STAR” LIKE?

- * Our star, the Sun, is an average sized, middle-aged, Main Sequence star.
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SO, WHAT'S “OUR STAR” LIKE?

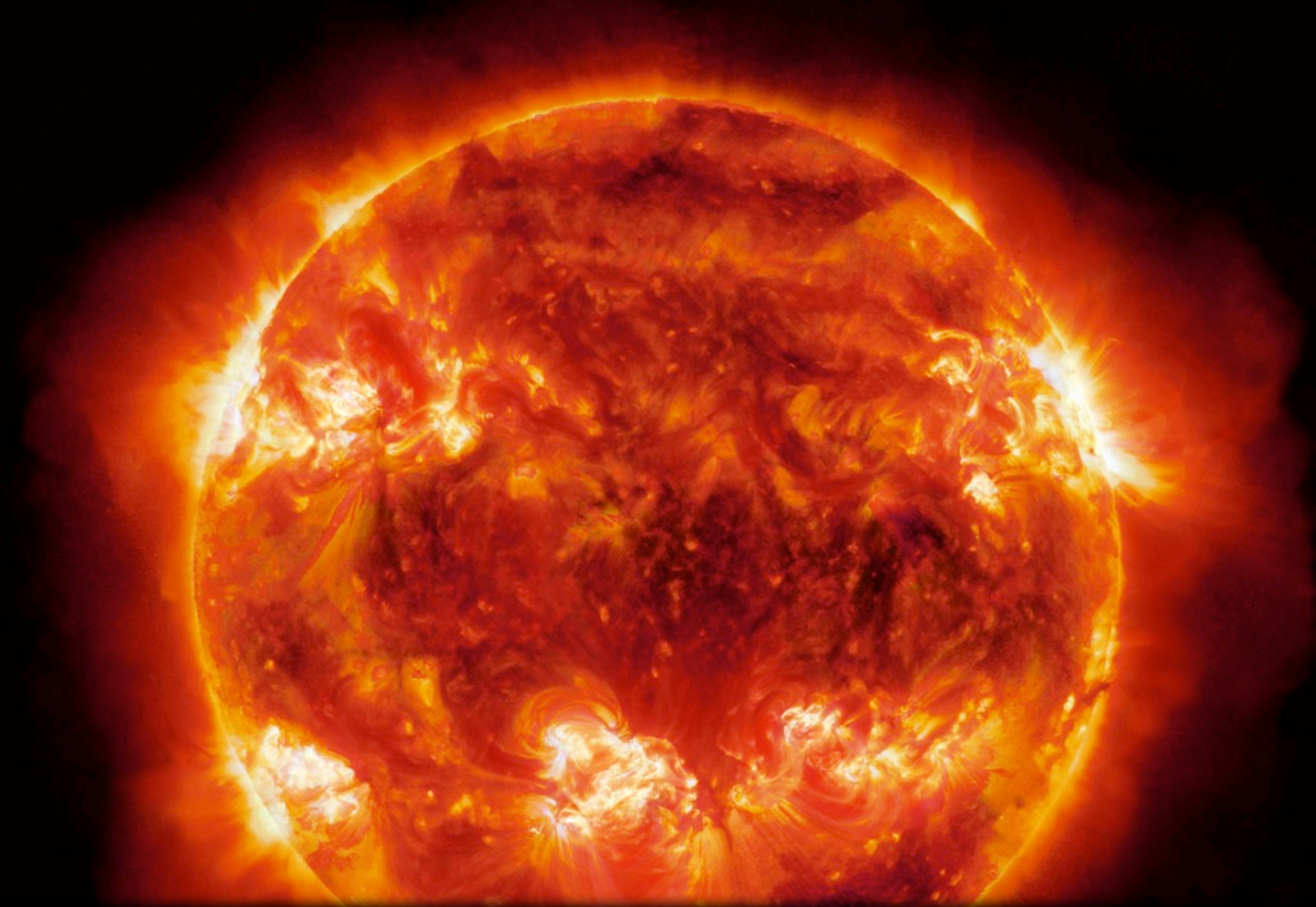
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- * It formed, along with our solar system, 4.6 billion years ago.
- * It is composed of about half Hydrogen and half Helium.
- * When it runs out of fuel in about 5 billion years, it will swell into a Red Giant, then collapse into a White Dwarf.

Life Cycle of the Sun



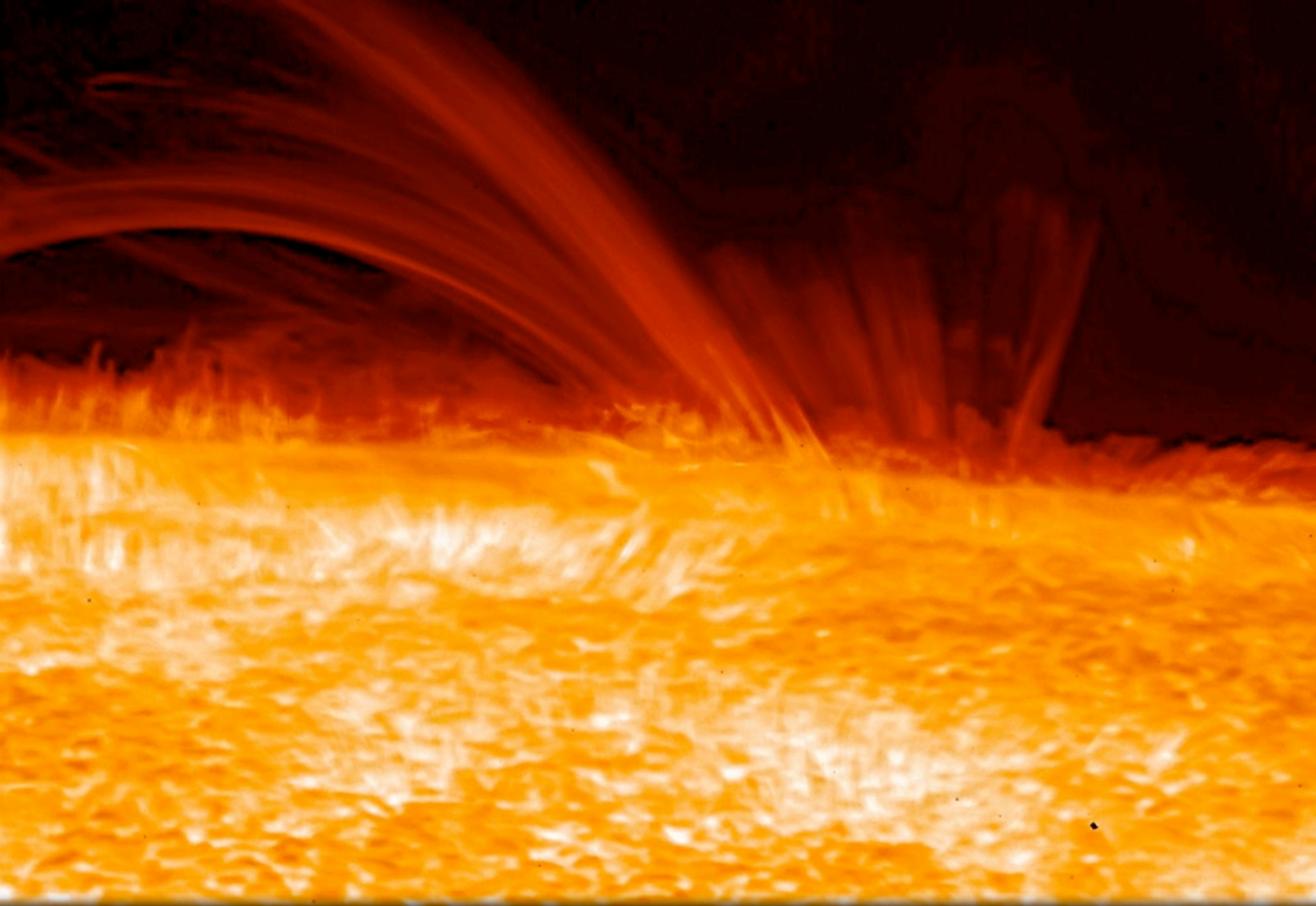
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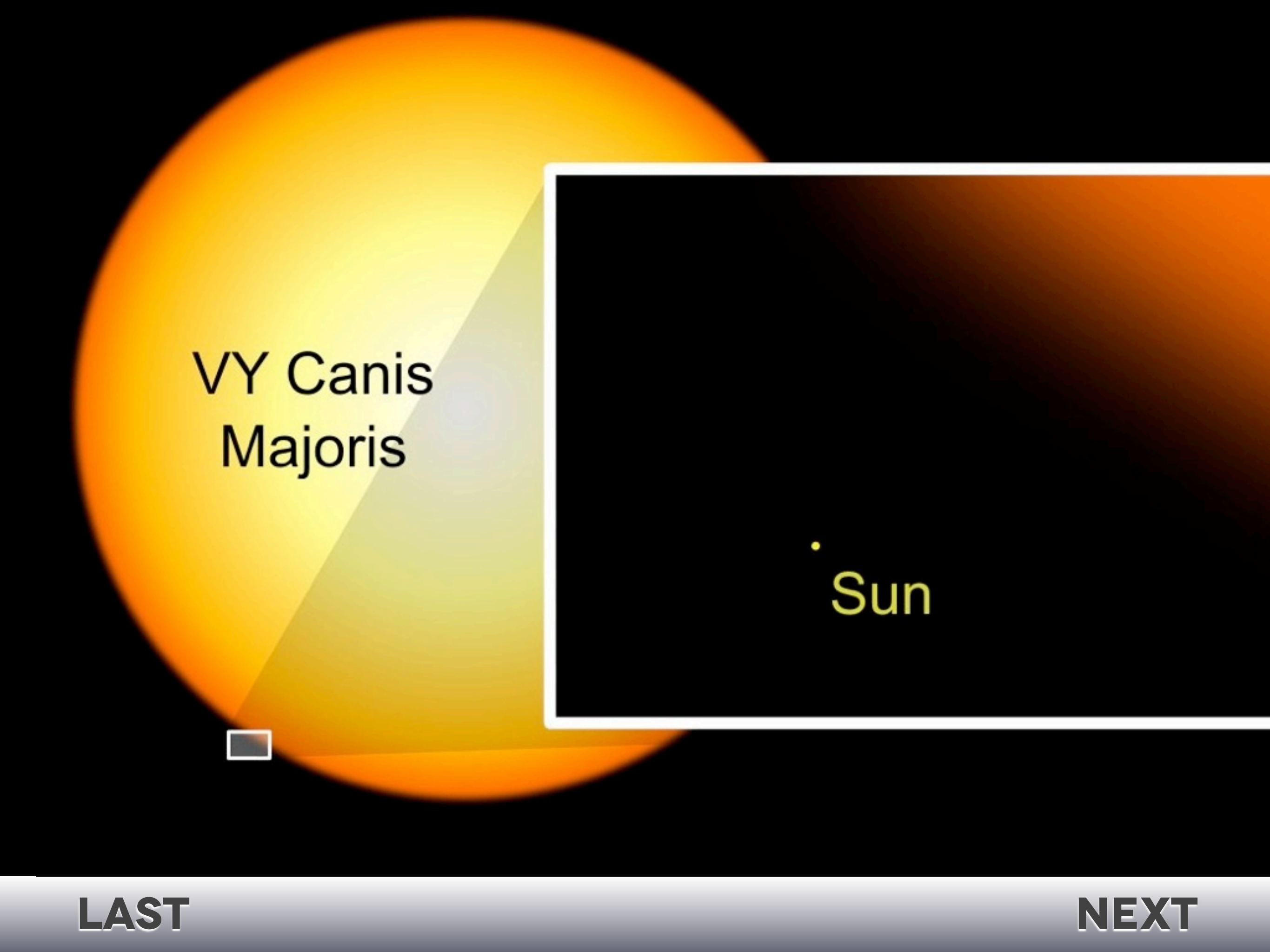
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A diagram comparing the Sun and VY Canis Majoris. On the left is a large orange-yellow sphere labeled 'VY Canis Majoris'. On the right is a much smaller yellow dot labeled 'Sun'. A white rectangular box is positioned between them, with a white arrow pointing from the Sun towards the larger sphere. A small white square is located at the bottom left of the VY Canis Majoris sphere.

VY Canis
Majoris

Sun

LET'S TRY SOME REGENTS QUESTIONS

LAST

NEXT

1. The reaction below represents an energy-producing process.



The reaction represents how energy is produced

- A) in the Sun by fusion
- B) when water condenses in Earth's atmosphere
- C) from the movement of crustal plates
- D) during nuclear decay

2. As the sun ages it will be composed of
- A) more hydrogen and less helium
 - B) more helium and less hydrogen
 - C) more oxygen and less carbon
 - D) less oxygen and more carbon

4. The most abundant element on the sun is

A) hydrogen

B) helium

C) carbon

D) oxygen

Hint: Look at the ESRT

5. Approximately how many times larger is the diameter of the sun compared to the earth?

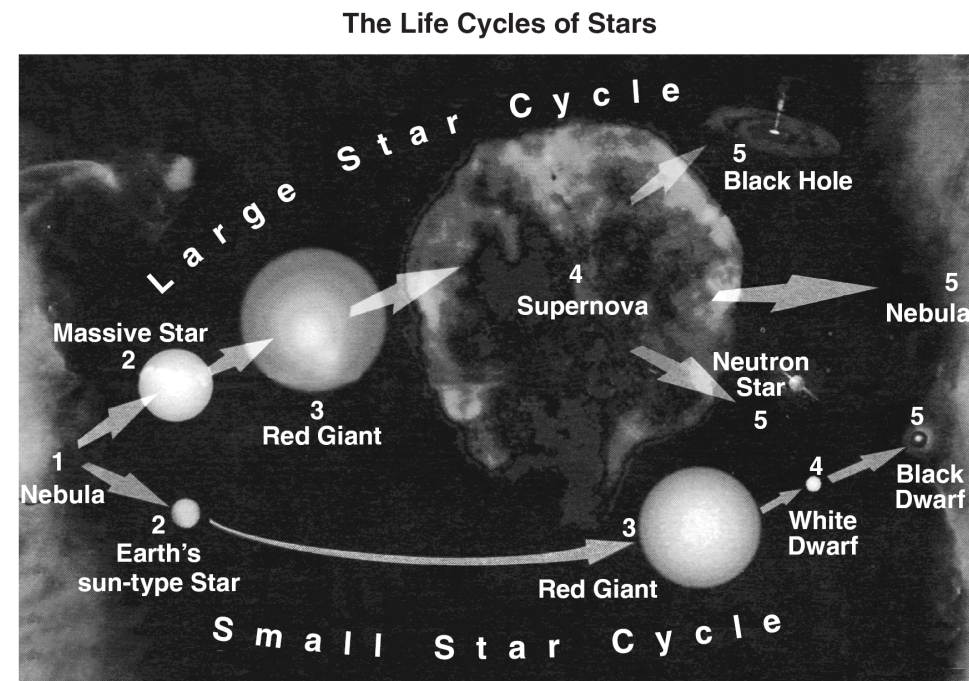
A) 10 times

B) 100 times

C) 1000 times

D) 10,000 times

Base your answers to questions 6 through 8 on the diagram below, which shows two possible sequences in the life cycle of stars, beginning with their formation from nebular gas clouds in space.



6. According to the diagram, a star like Earth's Sun will eventually
- A) explode in a supernova
 - B) become a black hole
 - C) change into a white dwarf
 - D) become a neutron star
7. Stars like Earth's Sun most likely formed directly from a
- A) nebula
 - B) supernova
 - C) red giant
 - D) black dwarf
8. According to the diagram, the life-cycle path followed by a star is determined by the star's initial
- A) mass and size
 - B) temperature and origin
 - C) luminosity and color
 - D) luminosity and structure

9. By which process do stars convert mass into great amounts of energy?

A) nuclear fusion

B) heat transfer

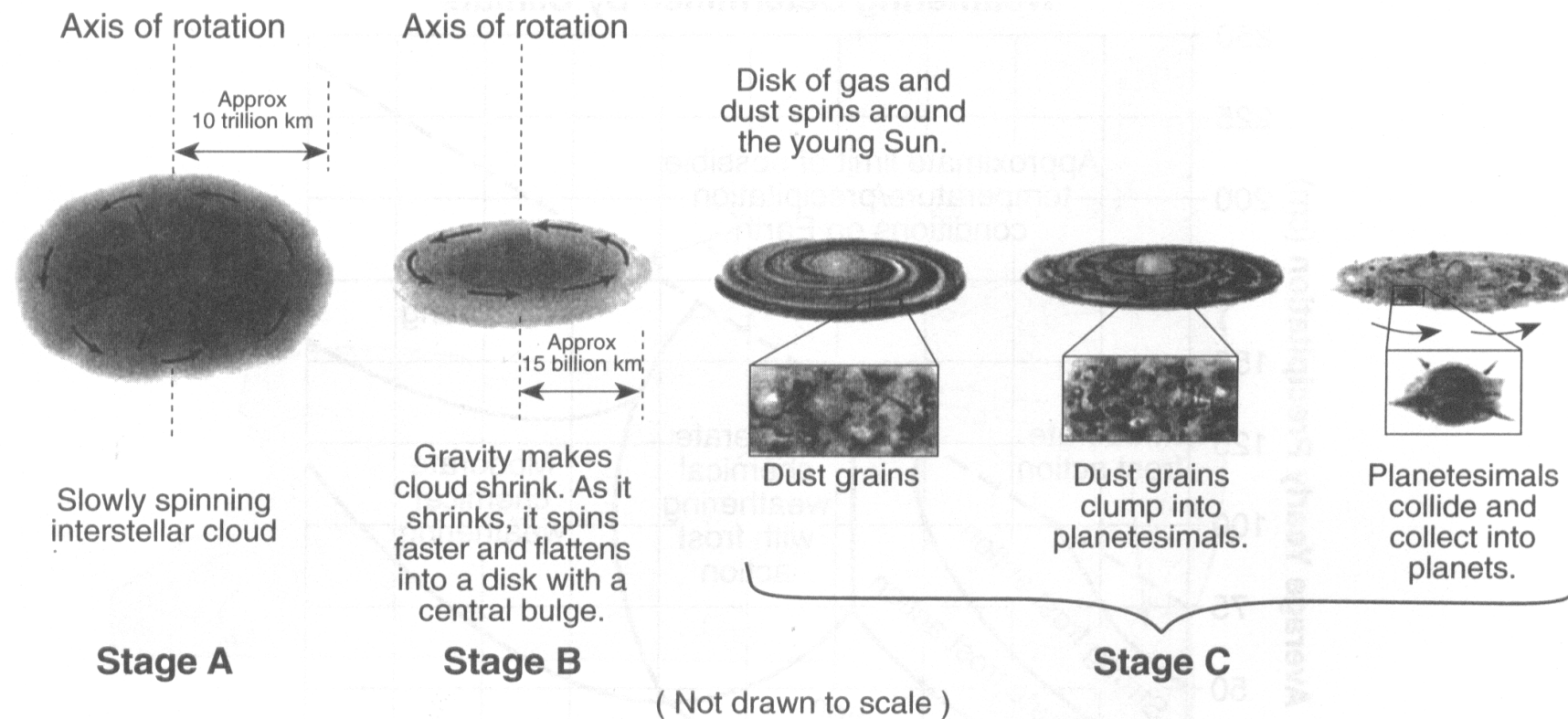
C) gravitational pull

D) radioactive decay

10. Which object forms by the contraction of a large sphere of gases causing the nuclear fusion of lighter elements into heavier elements?

A) comet B) planet C) star D) moon

11. Base your answer to the following question on the diagram below, which shows an inferred sequence in which our solar system formed from a giant interstellar cloud of gas and debris. Stage *A* shows the collapse of the gas cloud, stage *B* shows its flattening, and stage *C* shows the sequence that led to the formation of planets.



From stage *B* to stage *C*, the young Sun was created

- A) when gravity caused the center of the cloud to contract
- B) when gravity caused heavy dust particles to split apart
- C) by outgassing from the spinning interstellar cloud
- D) by outgassing from Earth's interior

12. At which phase of its evolutionary life is a white dwarf star?

- A) the late phase for small mass star
- B) the remains of a larger star's explosion
- C) in the main sequence phase
- D) early phases, soon after a star's formation

13. The probable fate of our sun is

- A) to expand as a red giant, undergo a nova outburst and end as a white dwarf
- B) to shrink to a white dwarf then eventually expand to a red giant
- C) become hotter and expand into a blue supergiant
- D) to become a black hole

14. What factor from the choices below determines whether a star will evolve into a white dwarf, a neutron star, or a black hole?

A) mass

B) percentage of helium

C) percentage of carbon

D) apparent brightness

15. When a star less massive than our sun consumes all of its nuclear fuel it will then become a

A) white dwarf

B) nova

C) supernova

D) black hole

16. According to our present theories of stellar evolution, our sun will change next into

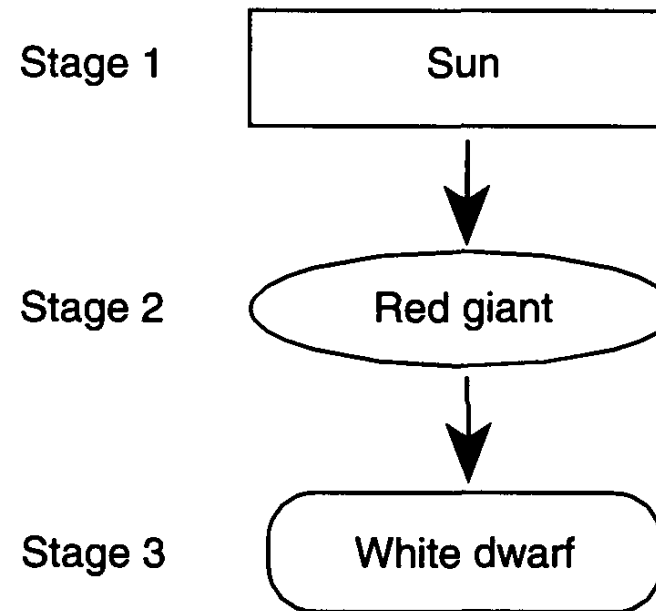
A) a white dwarf

B) a black hole

C) a supernova

D) a red giant

17. Stars are believed to undergo evolutionary changes over millions of years. The flowchart below shows stages of predicted changes in the Sun.



According to this flowchart, the Sun will become

- A) hotter and brighter in stage 2, then cooler and dimmer in stage 3
- B) cooler and dimmer in stage 2, then hotter and brighter in stage 3
- C) hotter and dimmer in stage 2, then cooler and brighter in stage 3
- D) cooler and brighter in stage 2, then hotter and dimmer in stage 3