Earth 101
Introduction to Astronomy

Galaxies

Instructor:
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OpenStax Ch 26
Galaxies

Photo/Material Credit:
- Fred Marschak
- Dr. Jatila van der Veen
- Erin O'Connor + others

HJNP

Other Galaxies

Virgo Supercluster

General Characterics of Galactic Types

Shape	Example	Features	Dust & Gas
Elliptical Galaxies		Largest & Smallest	Almost no dust and gas
Disk Shaped Galaxies		Spiral Arms	Dust & gas in arms
Irregulars		No overall structure	Very rich in dust & gas

Distance Techniques

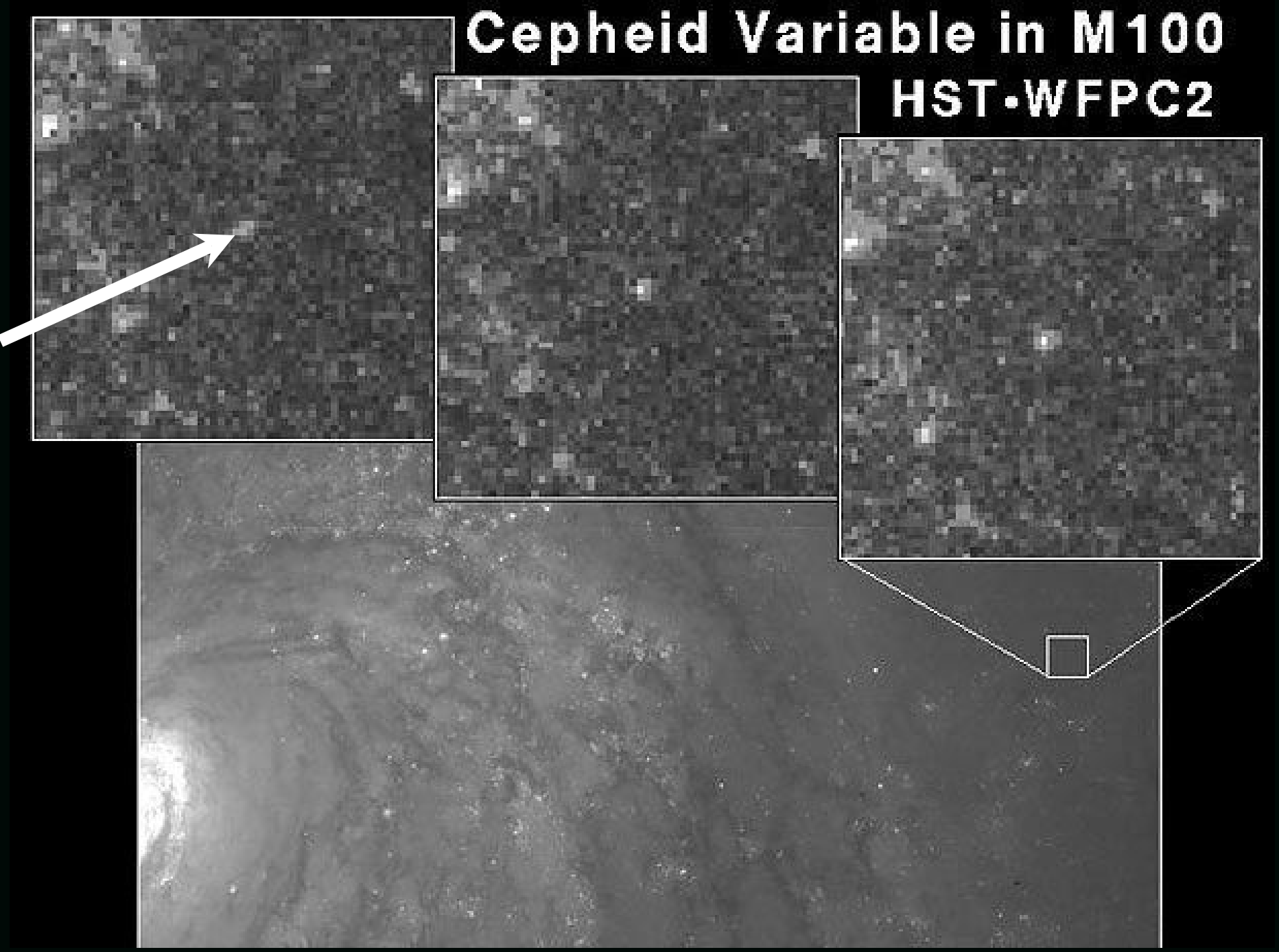
	Technique	Range	Example
Geometric Method	Parallax	100's of LY's	Our Sun's neighborhood
Standard Candle Method	A. Spectroscopic Parallax	Tens of thousands of LY	Within our Milky Way galaxy only
	B. Main Sequence Fitting	Hundreds of thousands of LY	Within area of Milky Way
	Cepheid Variables	Millions of LY	Other Galaxies

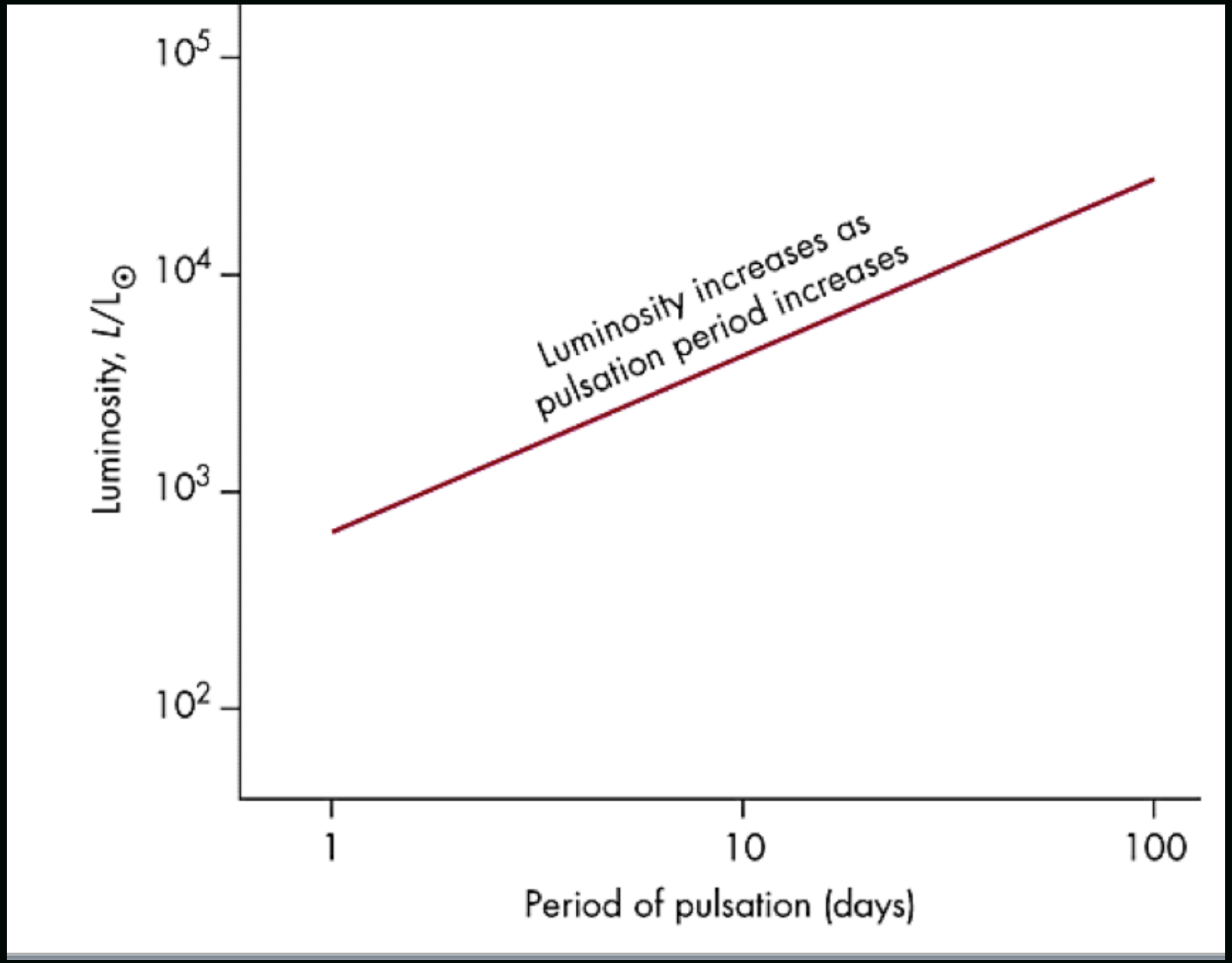
Add 2 rows

Henrietta Leavitt

Annie Cannon

Discovered how to use Cepheid Variables
to determine the distance to galaxies





Period - Luminosity Relationship of Cepheid Variables

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Add 2 rows

1. Anyone remember the difference between Type I and Type II Supernovae?

2. Anyone remember why a White Dwarf in a binary system can be a SUPERNOVA?

3. Why would Astronomers use a Type I and NOT a Type II Supernovae?

Supernovae Types

Type I Supernova

Binary System with a White Dwarf star

Type II Supernova

Guest Star of 1054

1845

72" Telescope used to observe a fuzzy spot in Taurus.

Called it the ... Crab Nebula

In 1885, astronomers observed ....

S - Andromeda

Fred Marschak

Supernovae

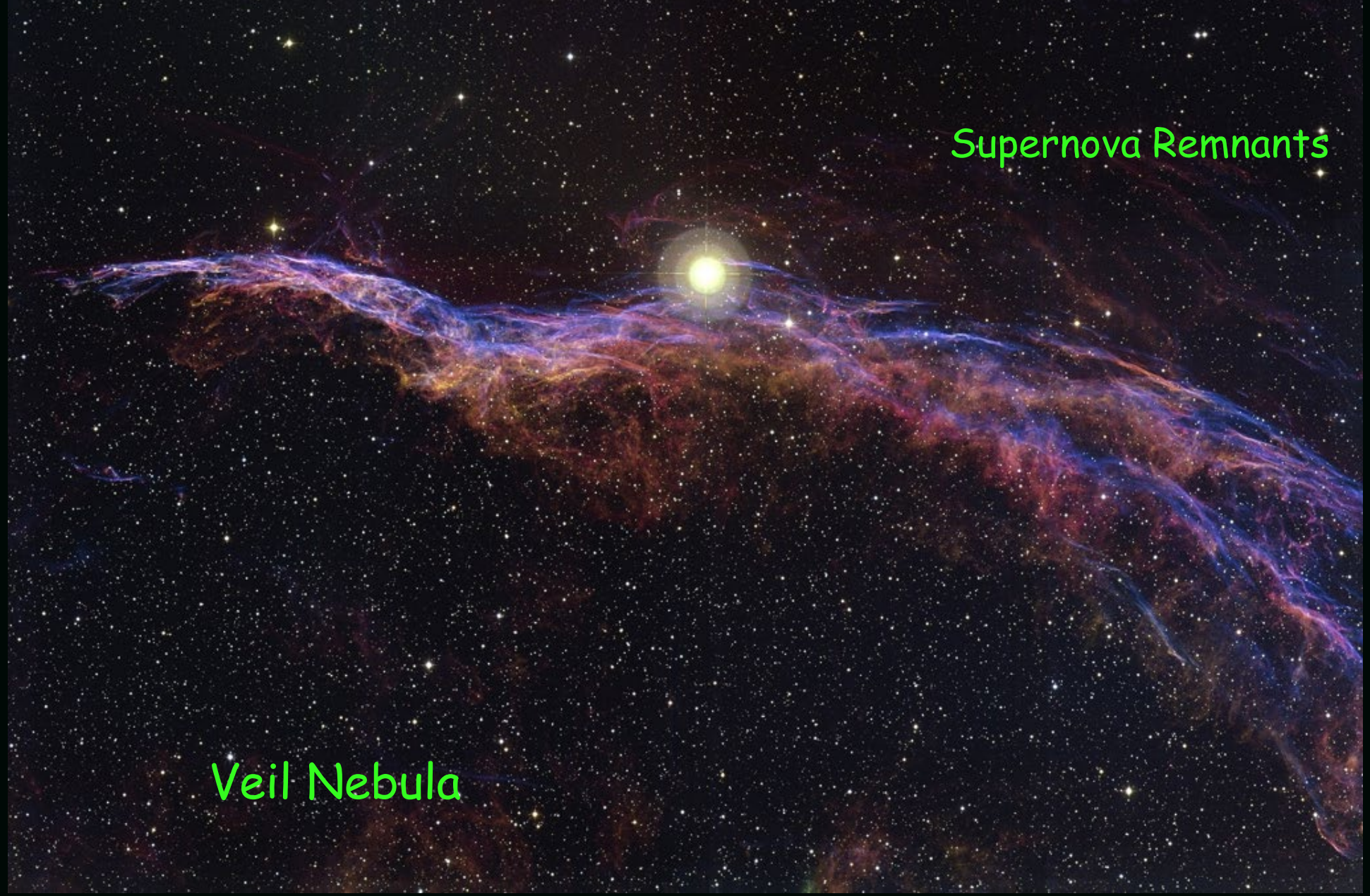
Visibility in the Milky Way
averages 1 per 100 years

Last one was in 1604 - Tycho's Star

A supernova within 30 LY

- Would be seen in the daytime
- Blast of X-Rays and UV
- Earth's atmosphere destroyed
- Statistically, 6 SN's in Earth's lifetime

Are SN remnants observable?



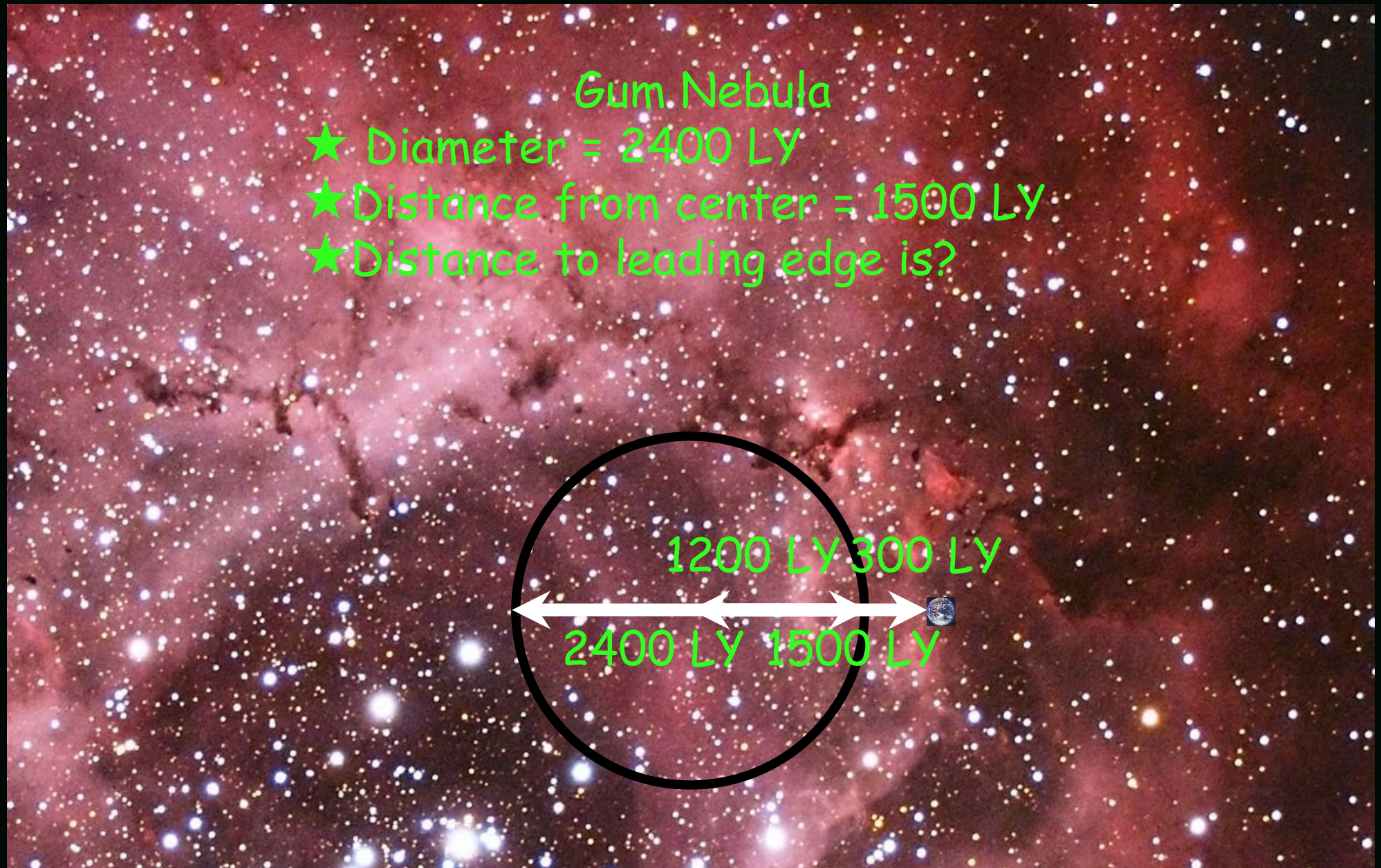
Supernova Remnants

Cygnus Loop

★Age: 50,000 years old
★Distance: 2500 LY
★Diameter: 70 LY

Angular Diameter
3 degrees

Supernova Remnants



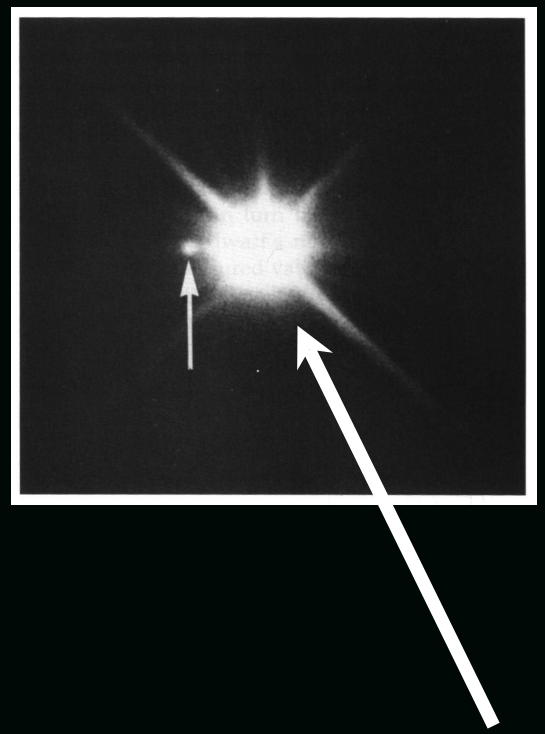
Nova vs. Supernova

Nova

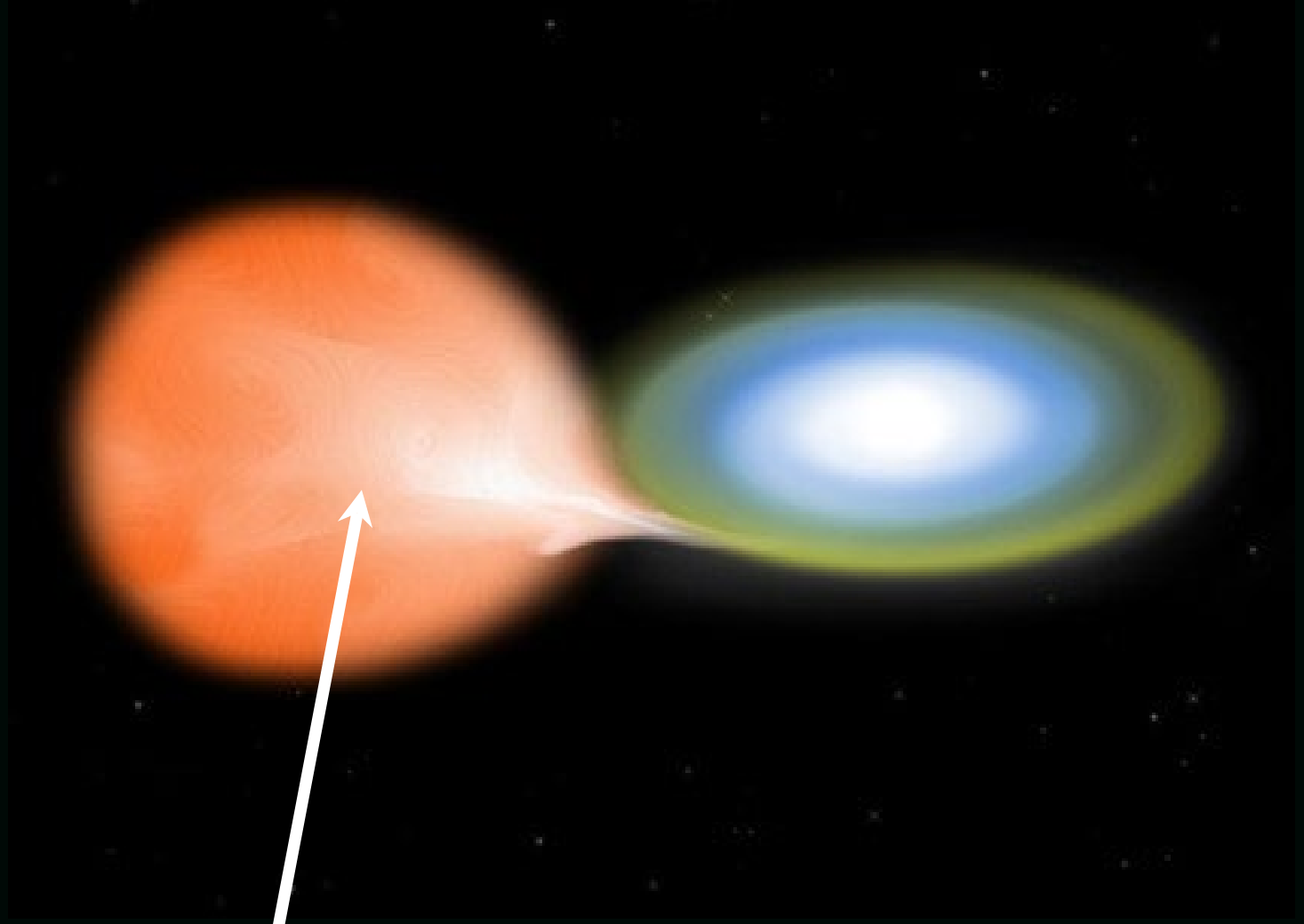
Stars in a binary system where:

* The more massive star of the two has become a White Dwarf

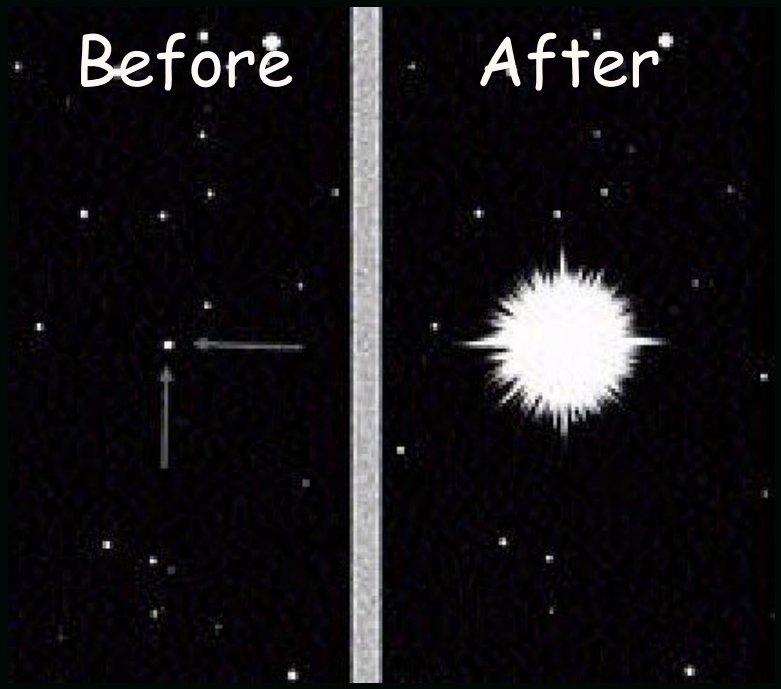
Given: This IS a White Dwarf. How do you know the other star is LESS massive than the parent of the White Dwarf Star was?



* The less massive star is evolving to a Red Giant



* The Red Giant exceeds its Roche Limit and dumps material on the White Dwarf Star resulting...



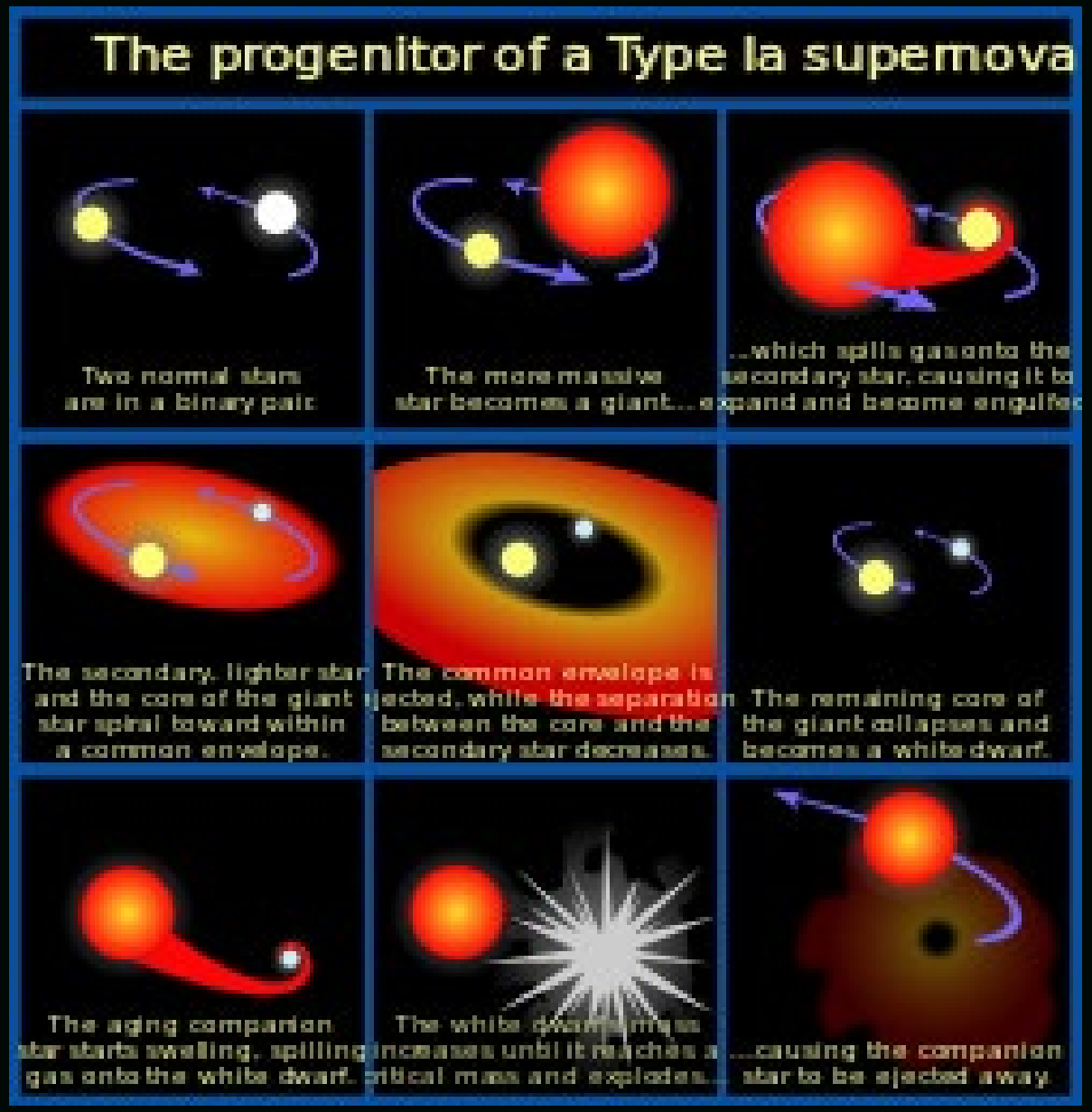
...in a NOVA.

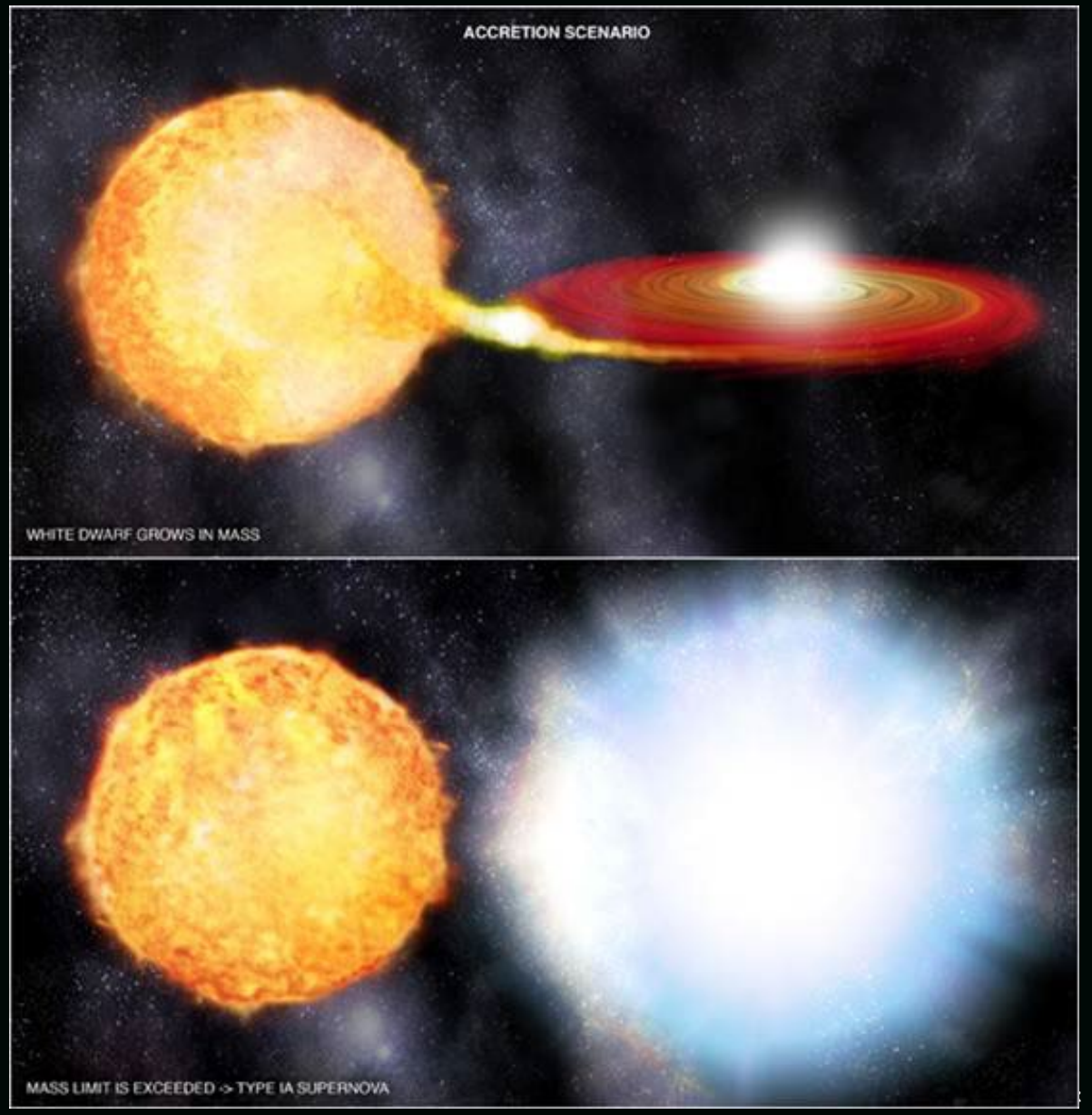
The white dwarf can repeat doing
this many times over years until...

(HINT: the mass of White Dwarf will increase
a little each time it goes 'Nova')

The White Dwarf 's mass may overcome Chandrasekher's
Limit and will become a type of Supernova.

Type I Supernova





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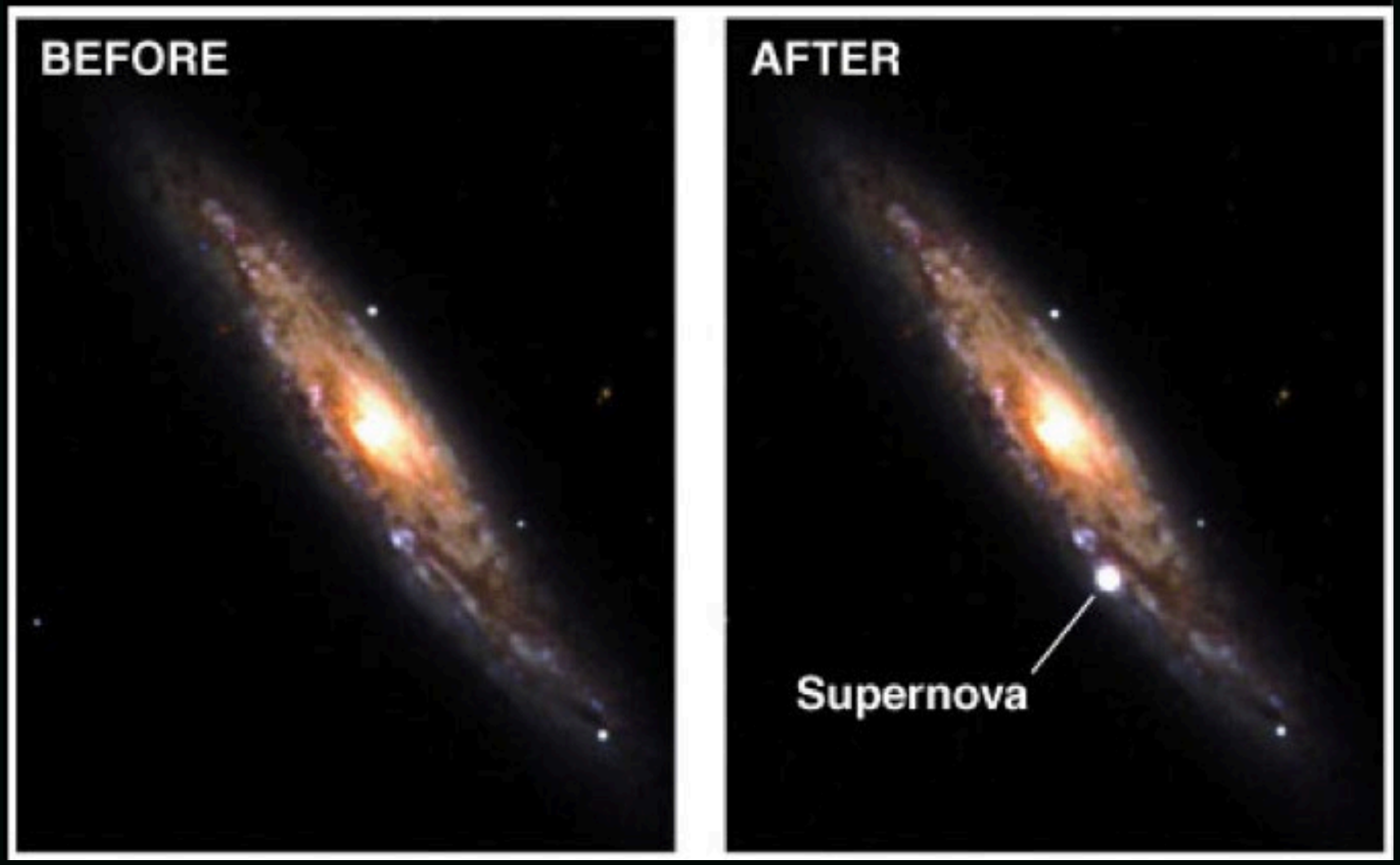
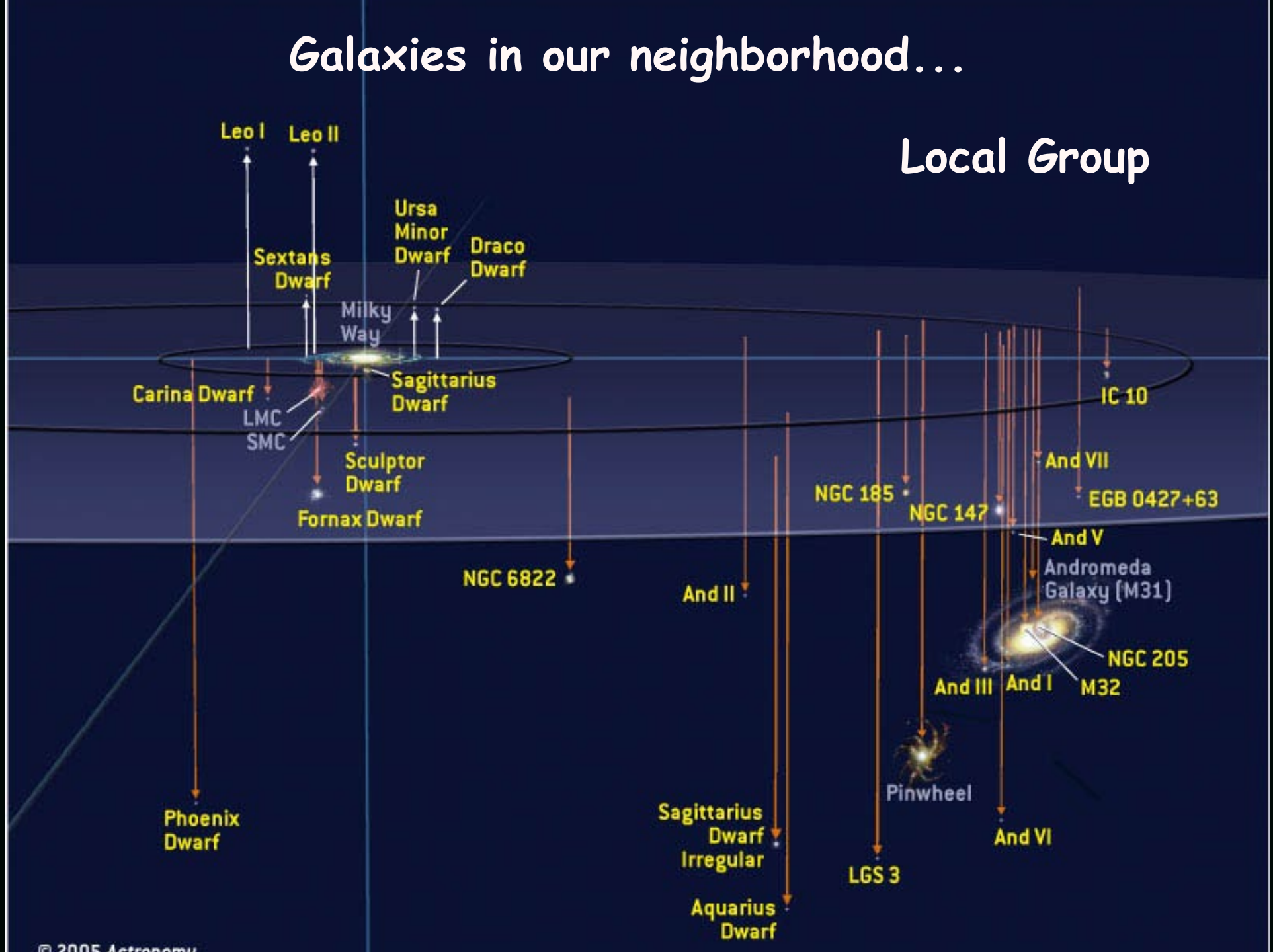
Supernova Type I	Billions of LY	Crab Nebula



Type I Supernova

Galaxies in our neighborhood...

Local Group



The Small and Large Magellanic Clouds

Which type has the least dust?

A. Irregulars
B. Ellipticals
C. Disk Shaped

Which type is the Milky Way?

A. Irregulars
B. Ellipticals
C. Disk Shaped

Which type of supernova do we use for most distance finding (Standard Candle)

A. Type III Supernova
B. Type II Supernova
C. Type I Supernova
D. trick question: all 3 can be used

Cepheid Variables can be used as a Stand Candle because of their:

A. Mass-Luminosity Relationship
B. Period-Luminosity Relationship
C. Equivalence Relationship
D. Mass Relationship
E. Light Speed Relationship