

Physics 100, March 21, 2007

Set up group MTings w/ me

Presentation Schedule:

April 11

16

18 → grp 2 (nuclear bombs)

23 → grp 24A (Feynman)

25 → grp 24 (Galileo), grp 26 (Music)

Stars - from dust to dust



Star-Birth Clouds · M16 HST · WFPC2
PRC95-44b · ST ScI OPO · November 2, 1995
J. Hester and P. Scowen (AZ State Univ.), NASA

Stars Form From
Condensation of gas/dust
due to gravitation

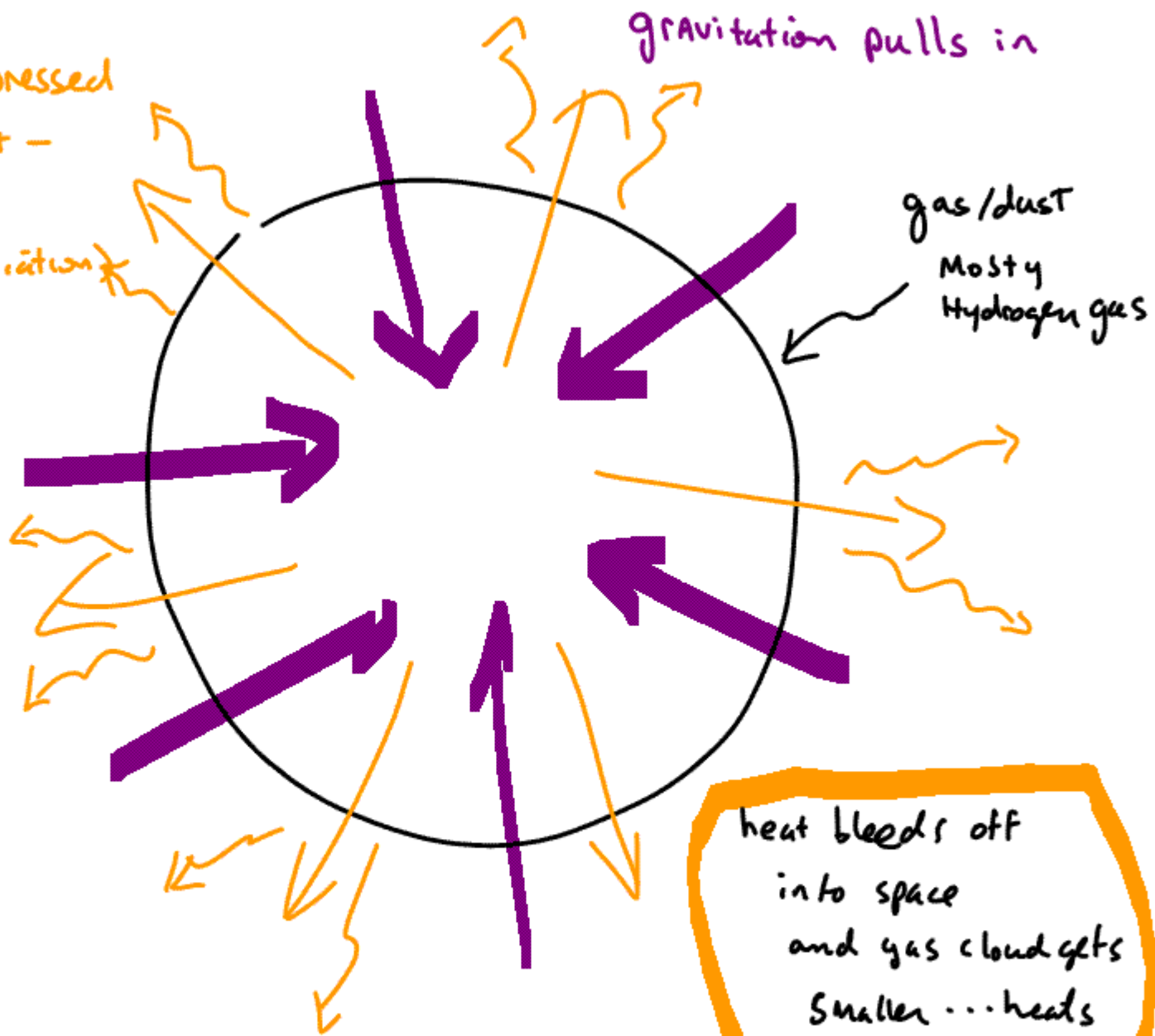
mostly hydrogen gas



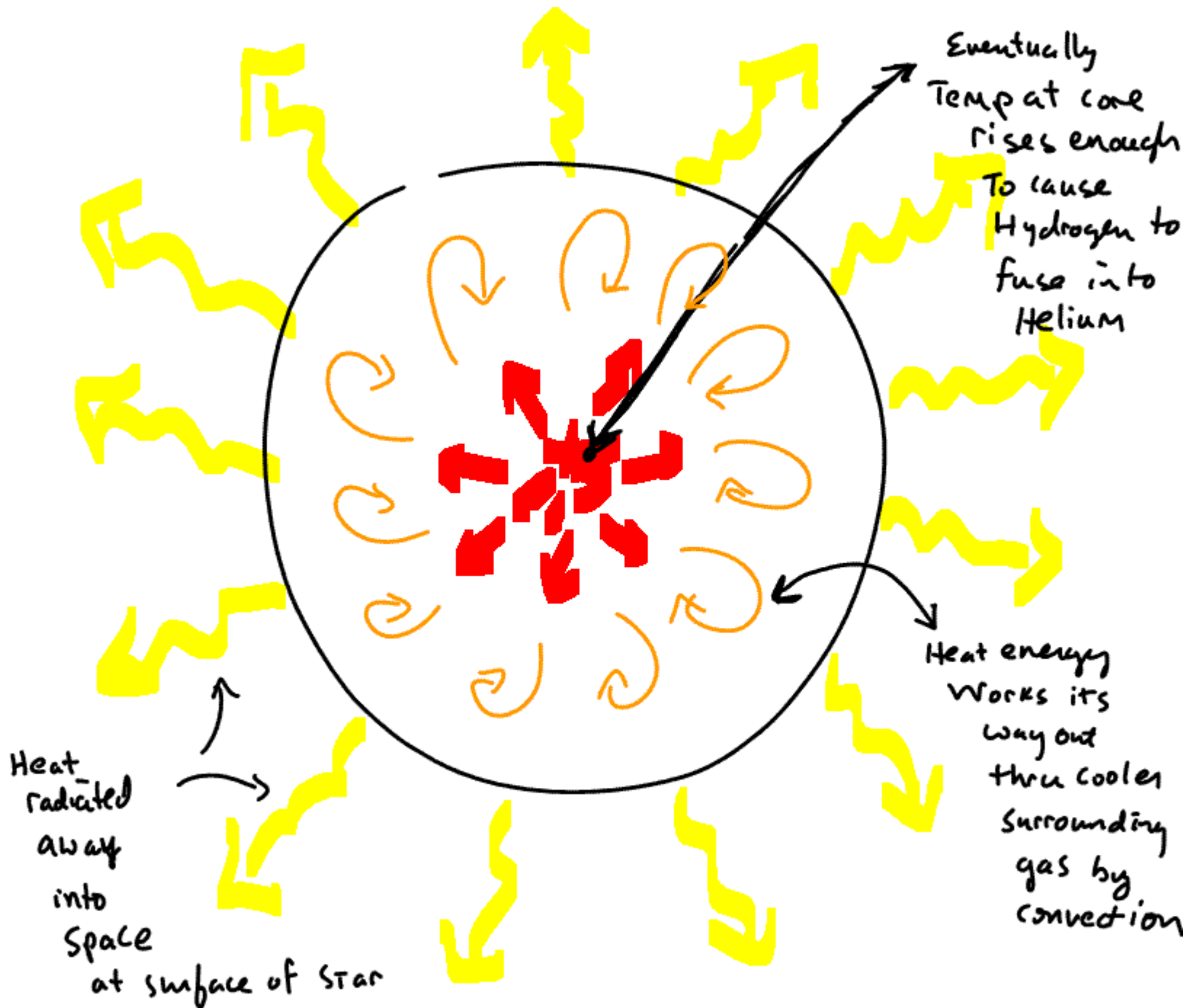
The Pleiades

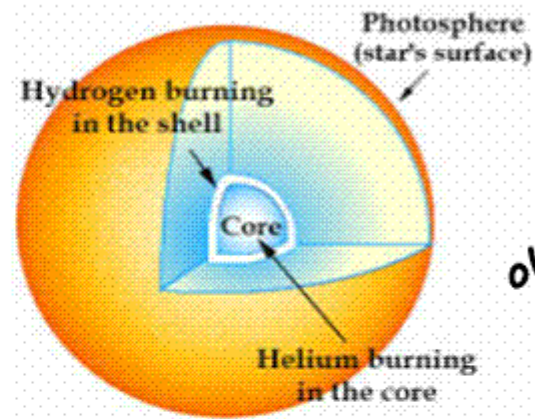
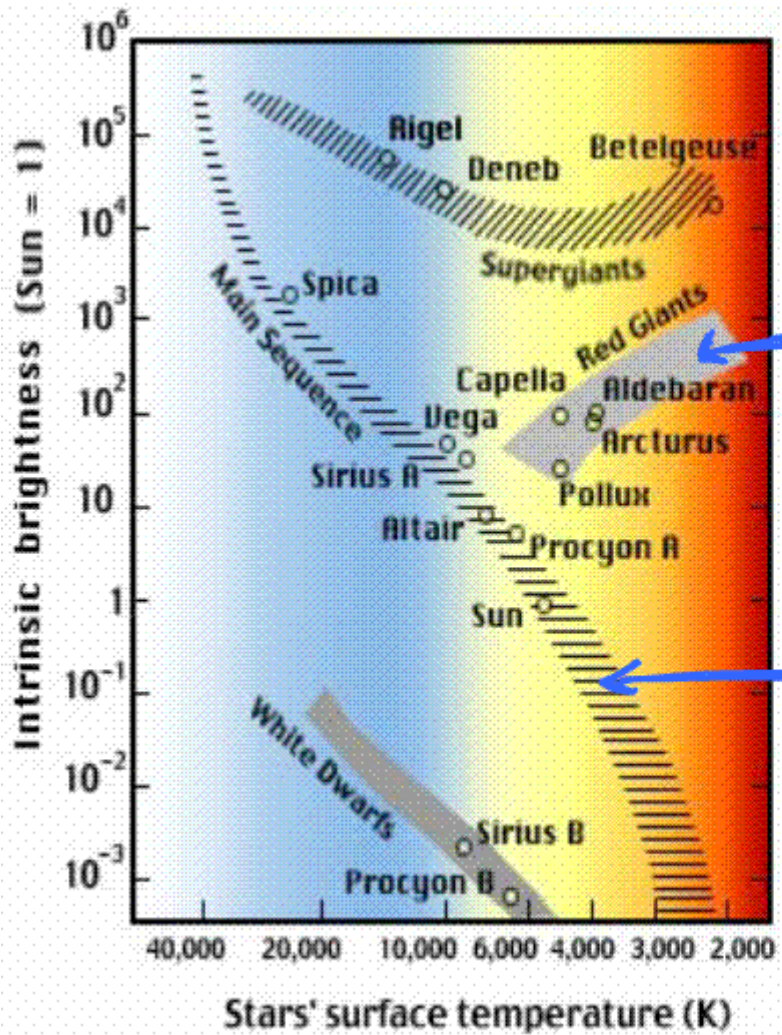
Young stars residual dust
surrounding them

As gas compressed
it gets hot -
This heat
(infrared radiation)
Pushes out

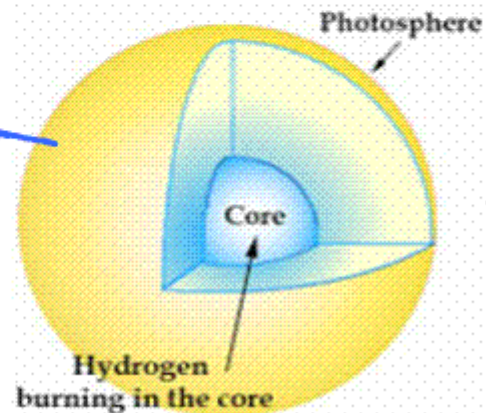


heat bleeds off
into space
and gas cloud gets
smaller ... heats
up some more.



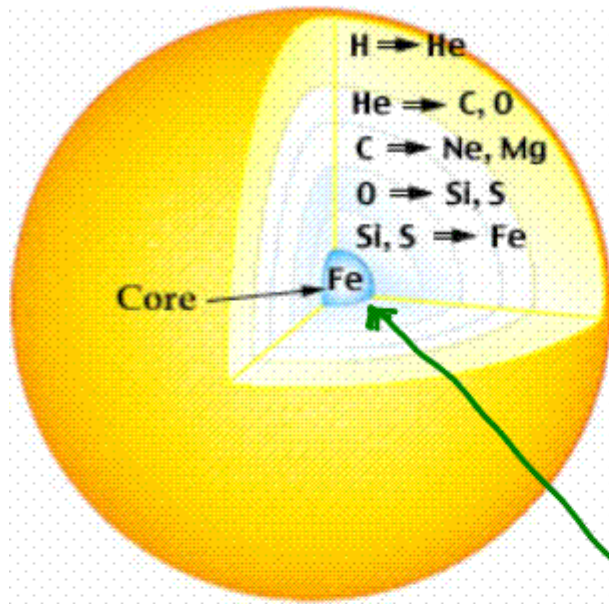


older



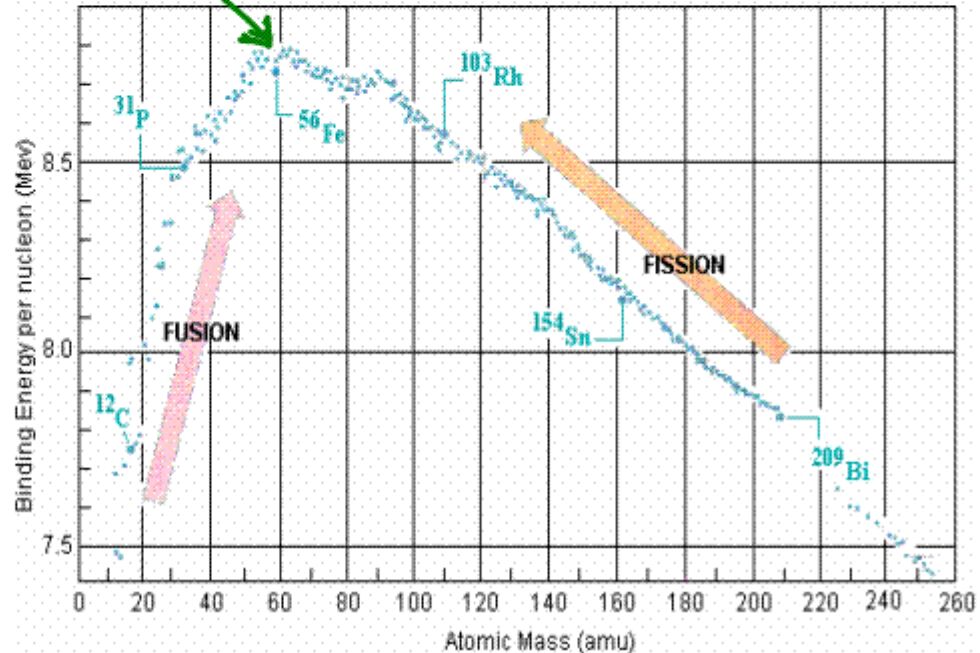
young





late l.ife massive star

fusion process into nuclei larger than ^{56}Fe takes energy rather than releasing energy



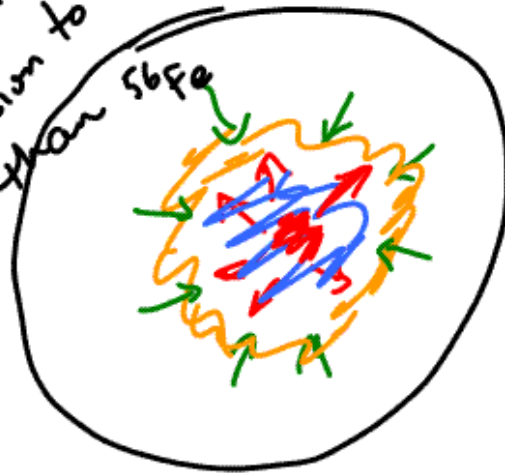
Very Schematic idea of Nova / Supernova



Fusion reactions cease in
core - outward
pressure reduced

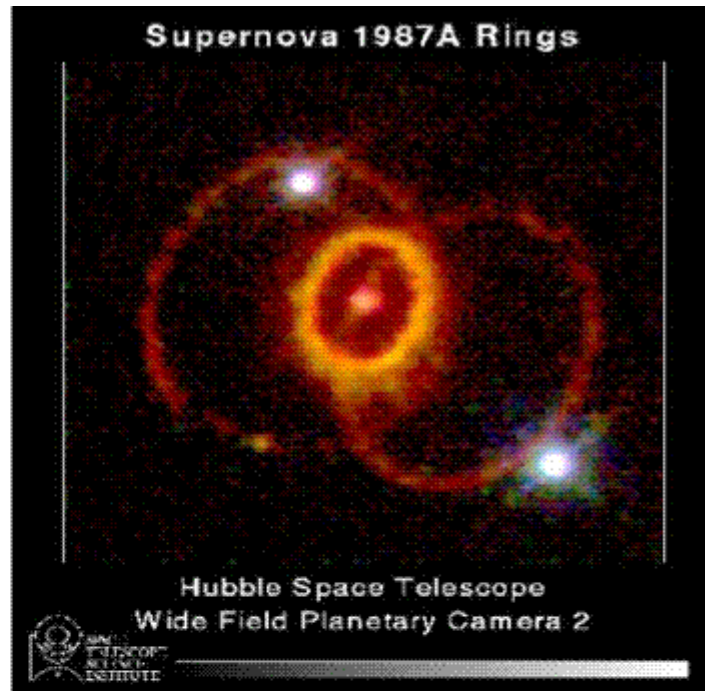
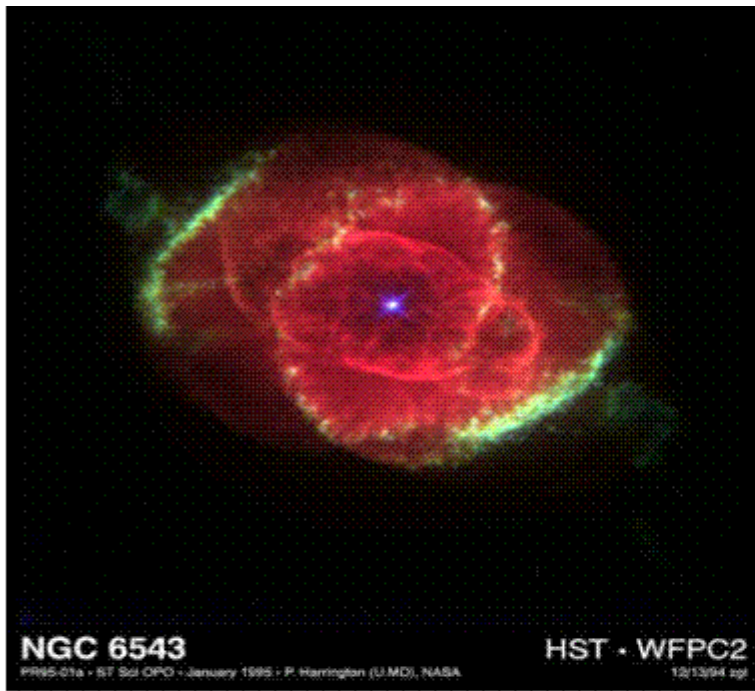
Shell begins to
collapse inward

blows off outer layers
of shell ... huge amount
of energy allows fusion to
elements larger than

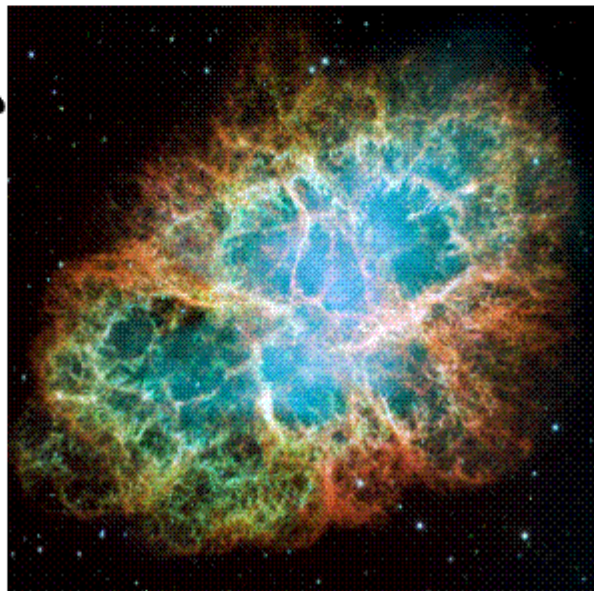


Core or inner part of
shell reignite
w/ fusion reaction
due to temperature
increase

Collapsing shell gets squashed between grav. motions in
and new burst of radiation pressure out
huge amt of fusion \rightarrow explosive



STAR went supernova in
1054 — observed during day
by Chinese and Arab
Astronomers



Crab
Nebula
Star went
Supernova in
1054

Elements heavier than ^{56}Fe are synthesized in Supernovae

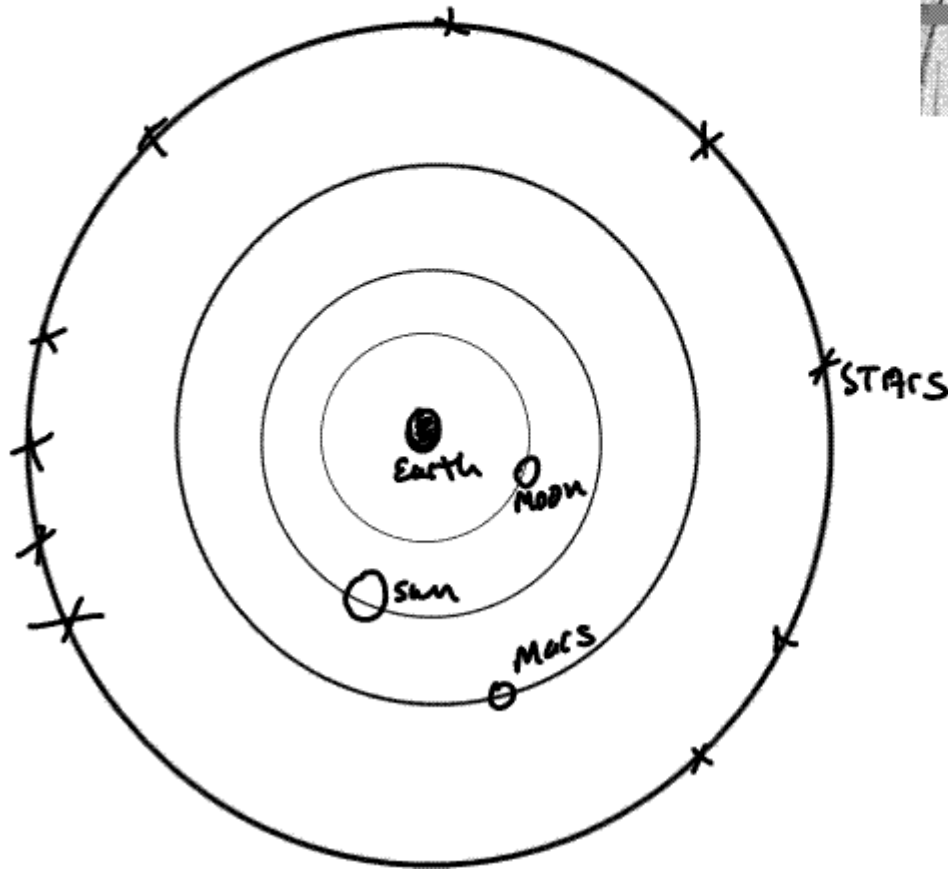
$M < 8 M_{\odot}$ \longrightarrow planetary nebulae

\searrow white dwarfs

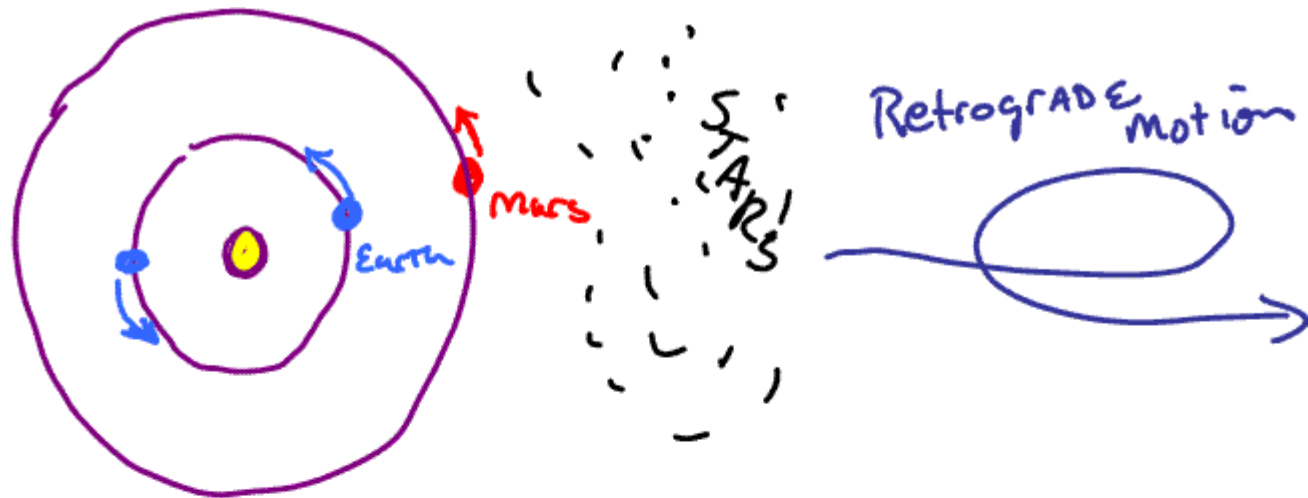
$M > 8 M_{\odot}$ \longrightarrow neutron star (pulsar)
or

Black hole

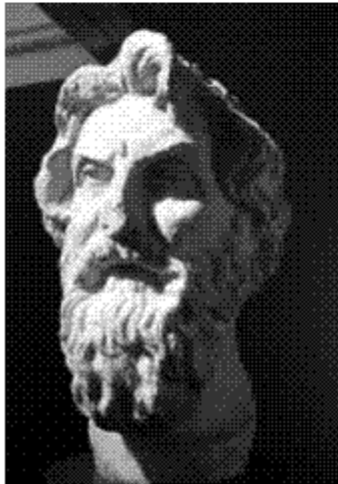
Pythagorean theory
Early Greek view of the universe



Pythagoras
of
Samos
~ 500 BC

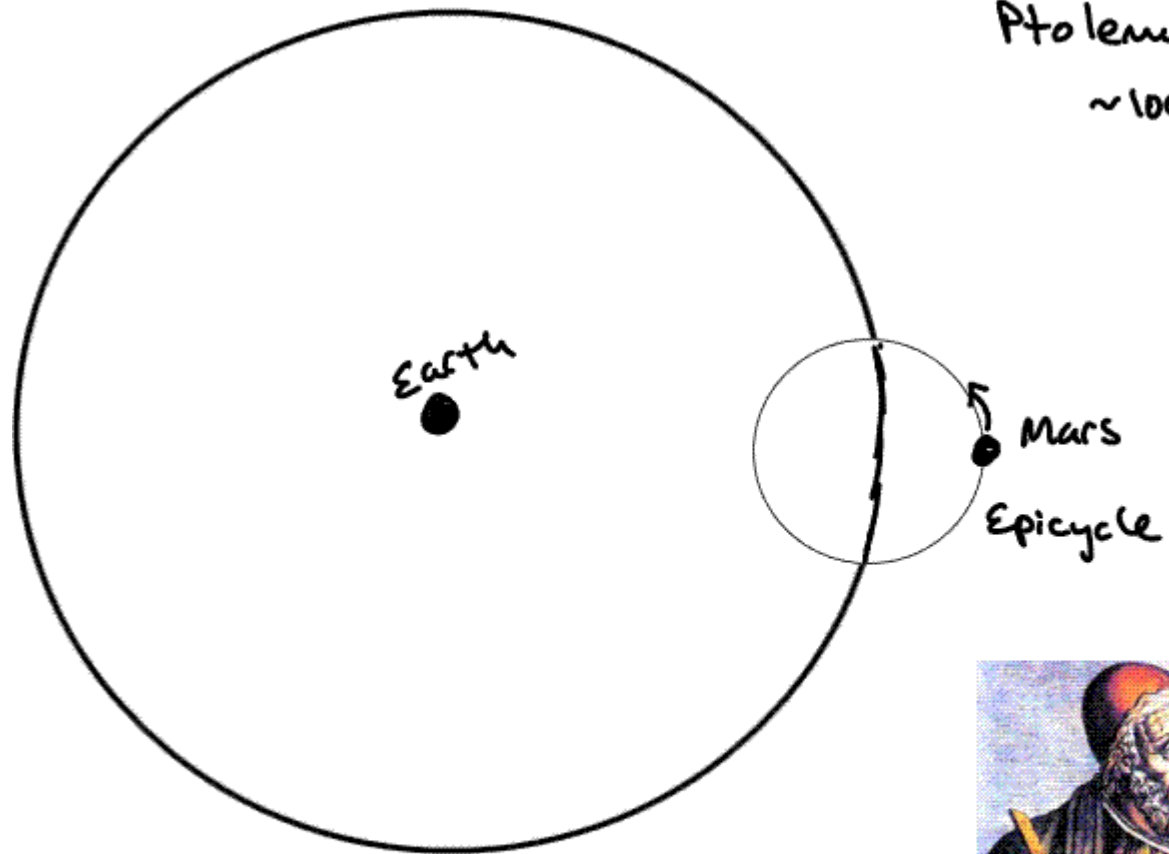


Plato ~ 400 BC ~ Multiple spheres



Aristarchus ~ 310 - 230 BC
(Greek)

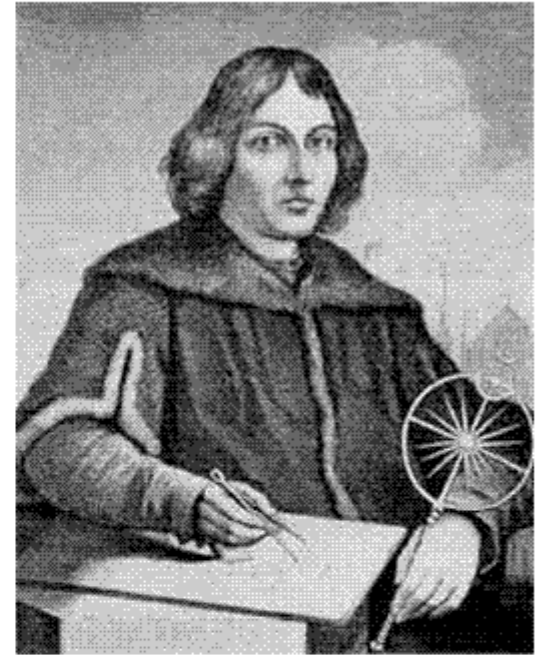
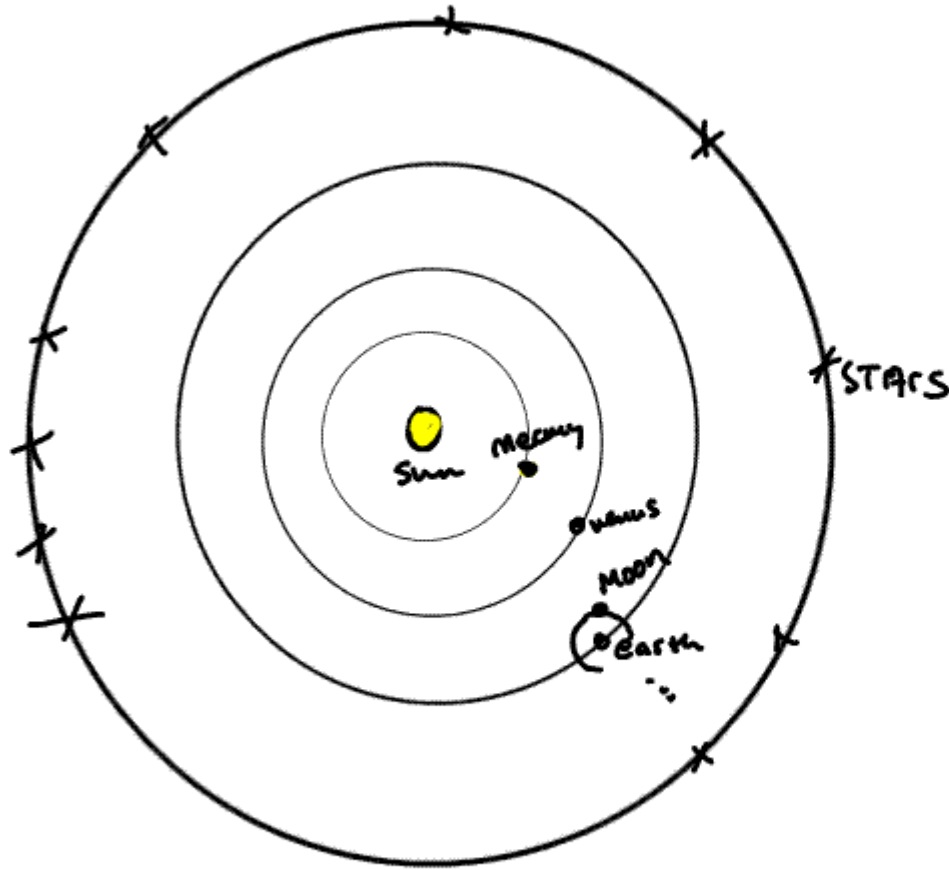
Proposed sun-centered universe
→ rejected



Ptolemy
~100 AD



Sun Centered universe



Nicolaus Copernicus
1473-1543
(Poland)

On the Revolutions of the
Heavenly Spheres

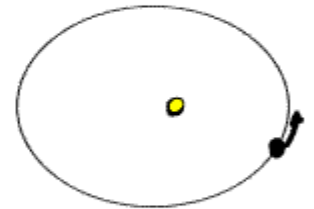
Brake's data did NOT fit perfectly
with Copernicus' theory



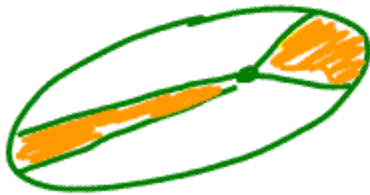
Tycho Brahe
1546-1601
(Dane)
careful observations
of positions
of Sun, Moon, planets



Johannes Kepler
1571-1630
(German)



⇒ Elliptical orbits
fits the data!



Determined 3 laws
that mathematically
describe orbits seen -
relate periods, areas, axes



Sir Isaac Newton
1643-1727
(England)

universal law of gravitation

$$F = G \frac{M_1 M_2}{r^2}$$

+

Laws of Motion

⇒ derived Kepler's

3 laws of planetary motion