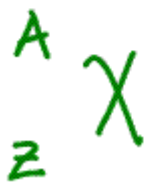
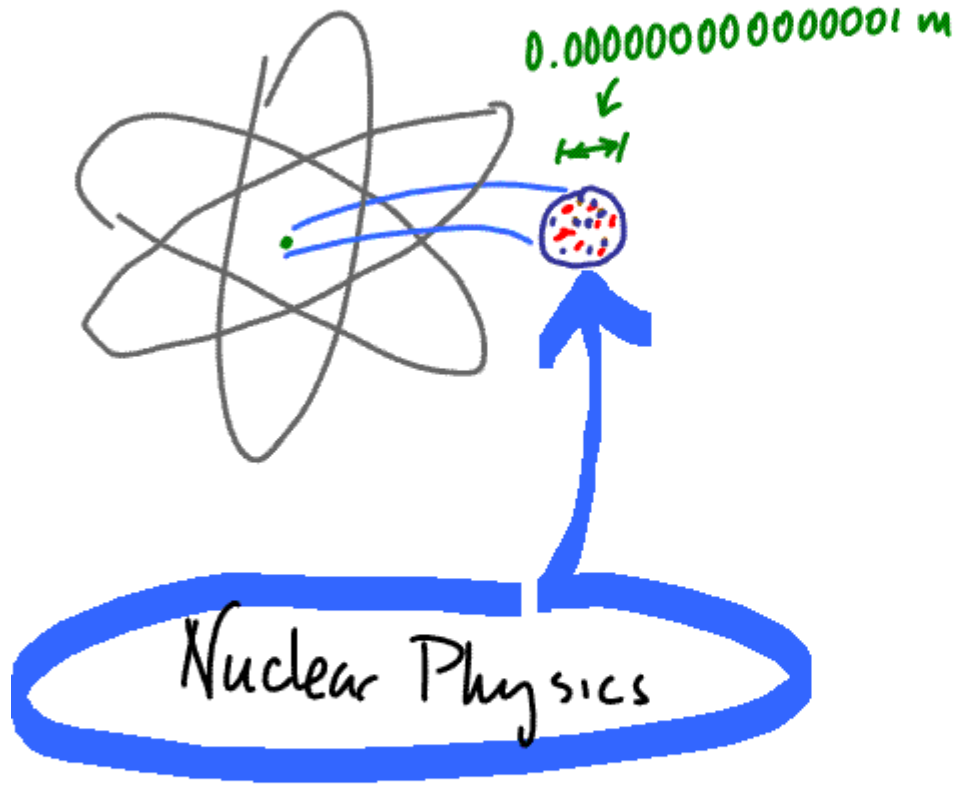


Physics 100 - October 31, 2007



Happy Halloween!



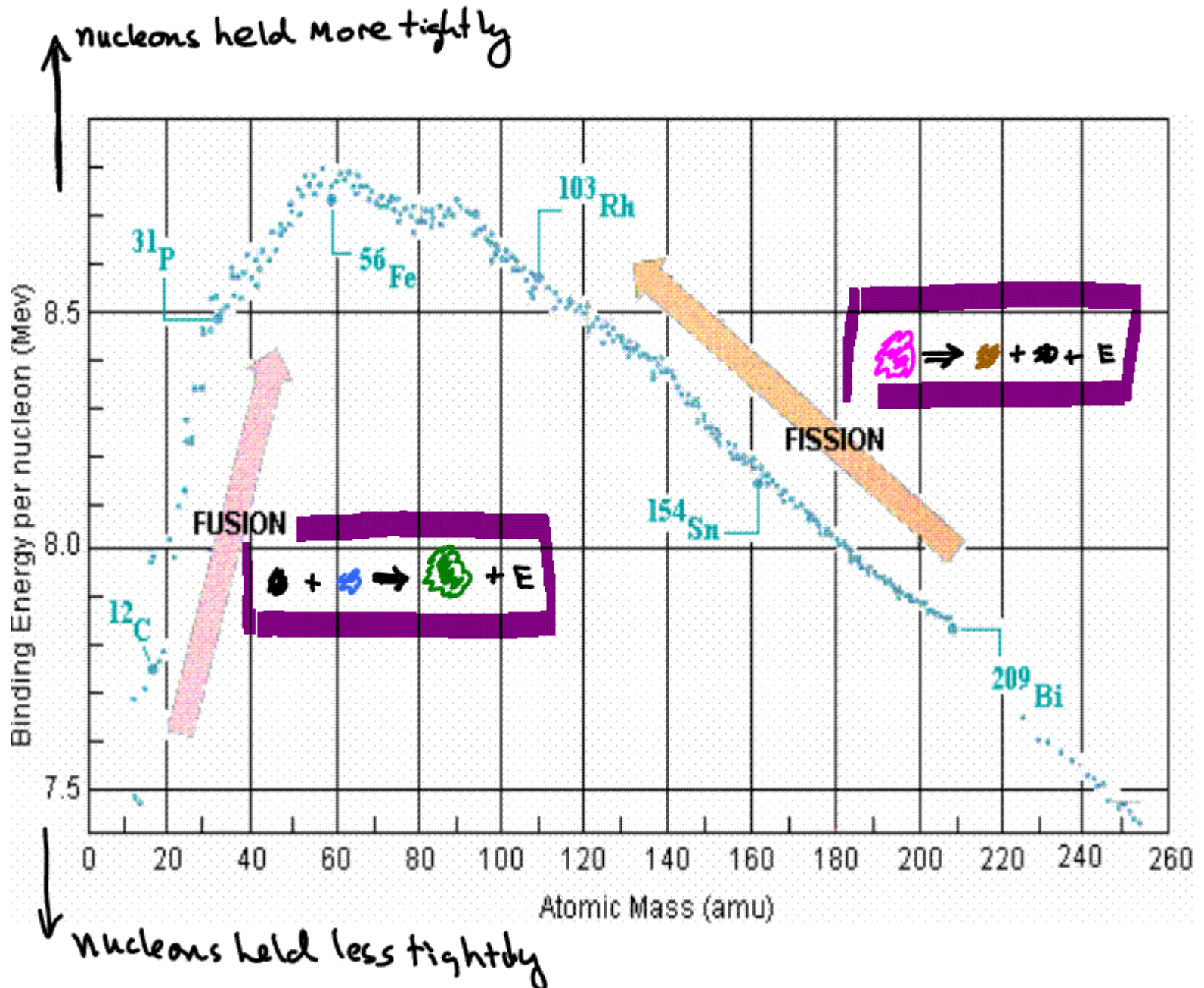
$A \equiv \# \text{ protons} + \# \text{ neutrons}$

$Z \equiv \# \text{ protons}$

$\chi \equiv \text{element symbol}$

equivalent info
determines "chemical"
characteristics

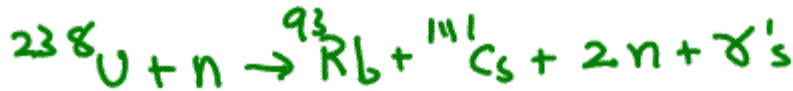
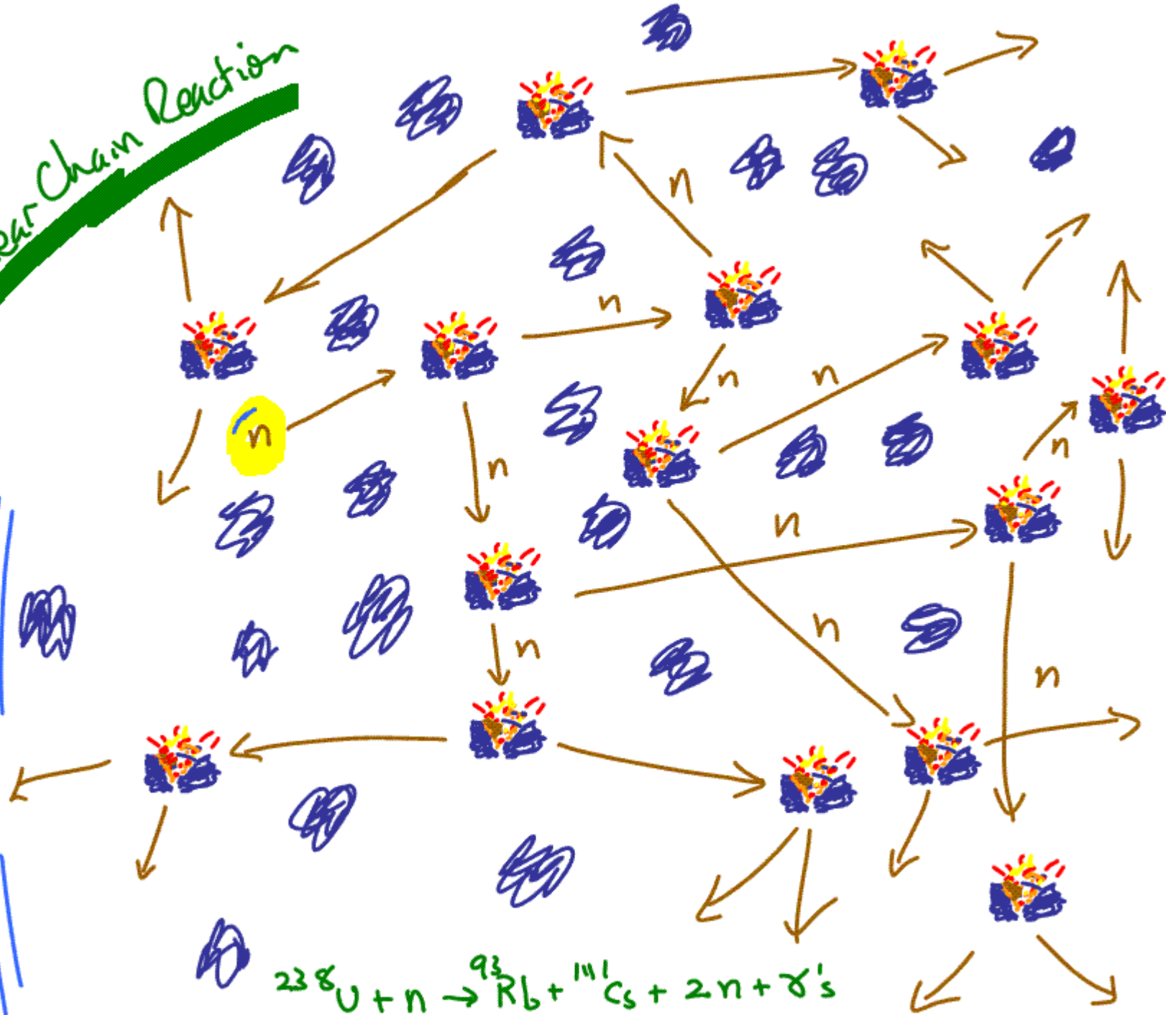
Inherent Nuclear Stability as function of nuclear size



Nuclear Chain Reaction

> 1 split per split

Supercritical





Critical
1 split per split

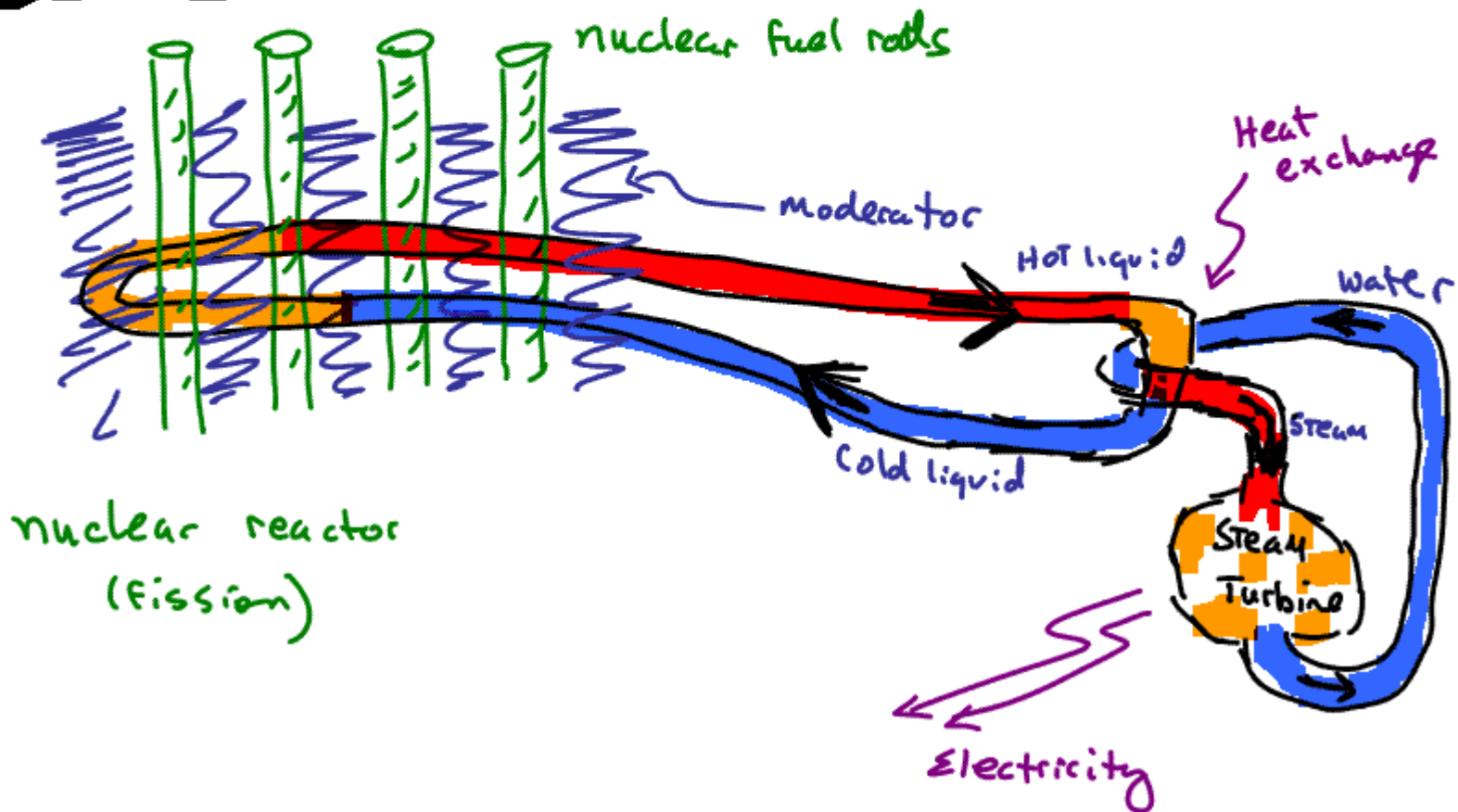
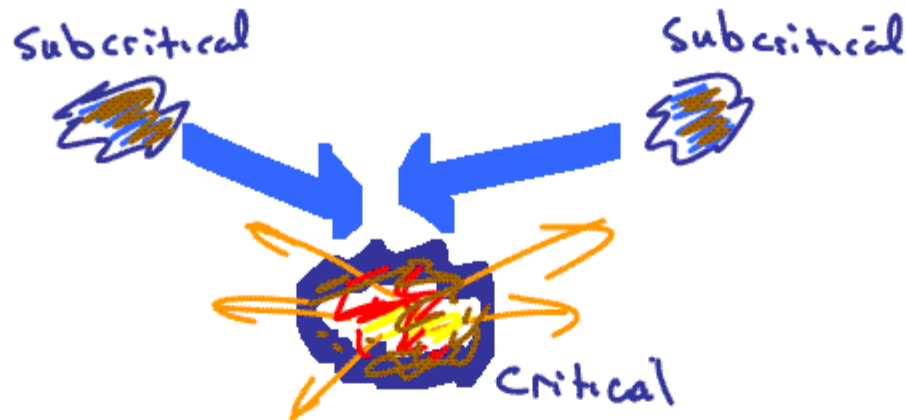


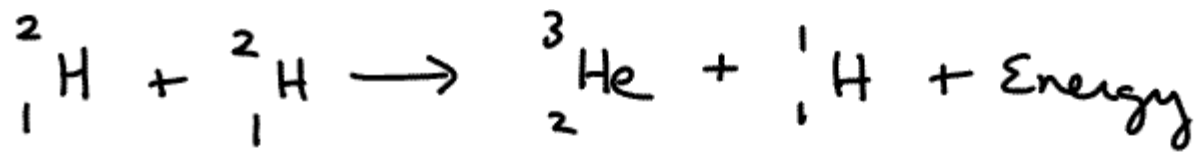
Subcritical
< 1 split per split

Supercritical \rightarrow nuclear bomb or nuclear meltdown

Critical \leftrightarrow Subcritical \rightsquigarrow nuclear reactor
sustained reaction

nuclear
Bomb
or
Meltdown





Fusion

Laboratory for
Laser Energetics
LLE

NOVA



Inertial
fusion

Attempts to create fusion in Lab

- Perhaps for commercial power
someday

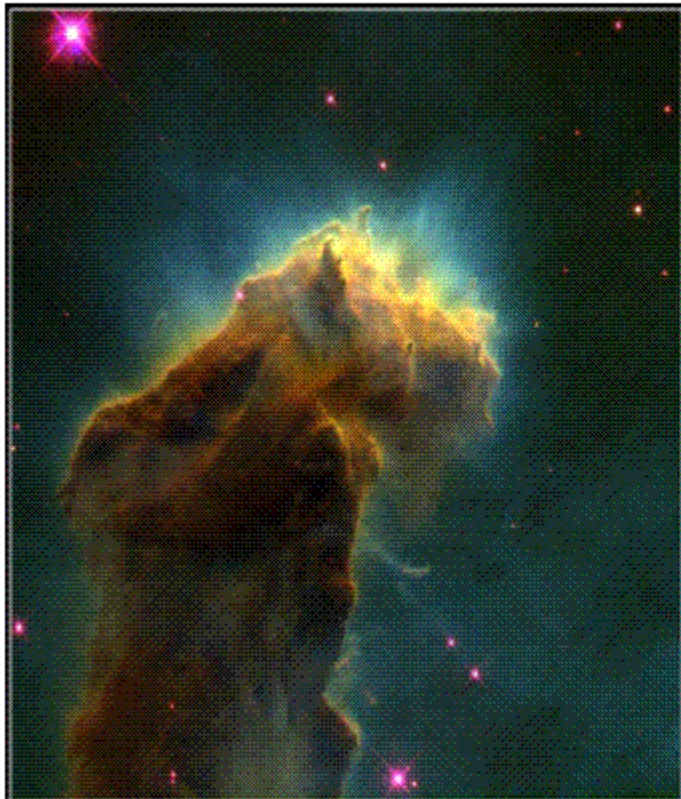


Big current international
Project ...
google it

ITER

magnetic
confinement

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

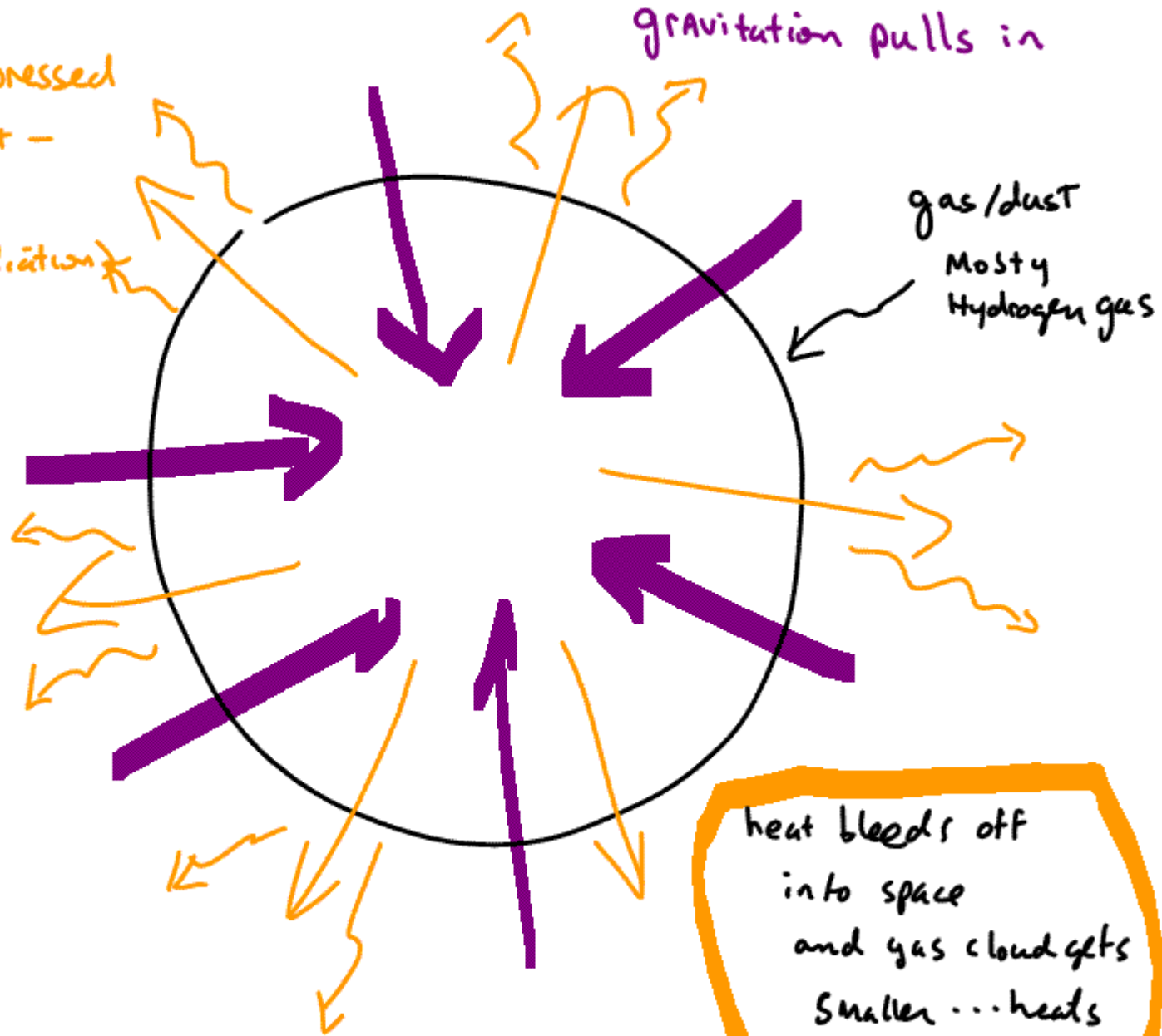
mostly hydrogen gas



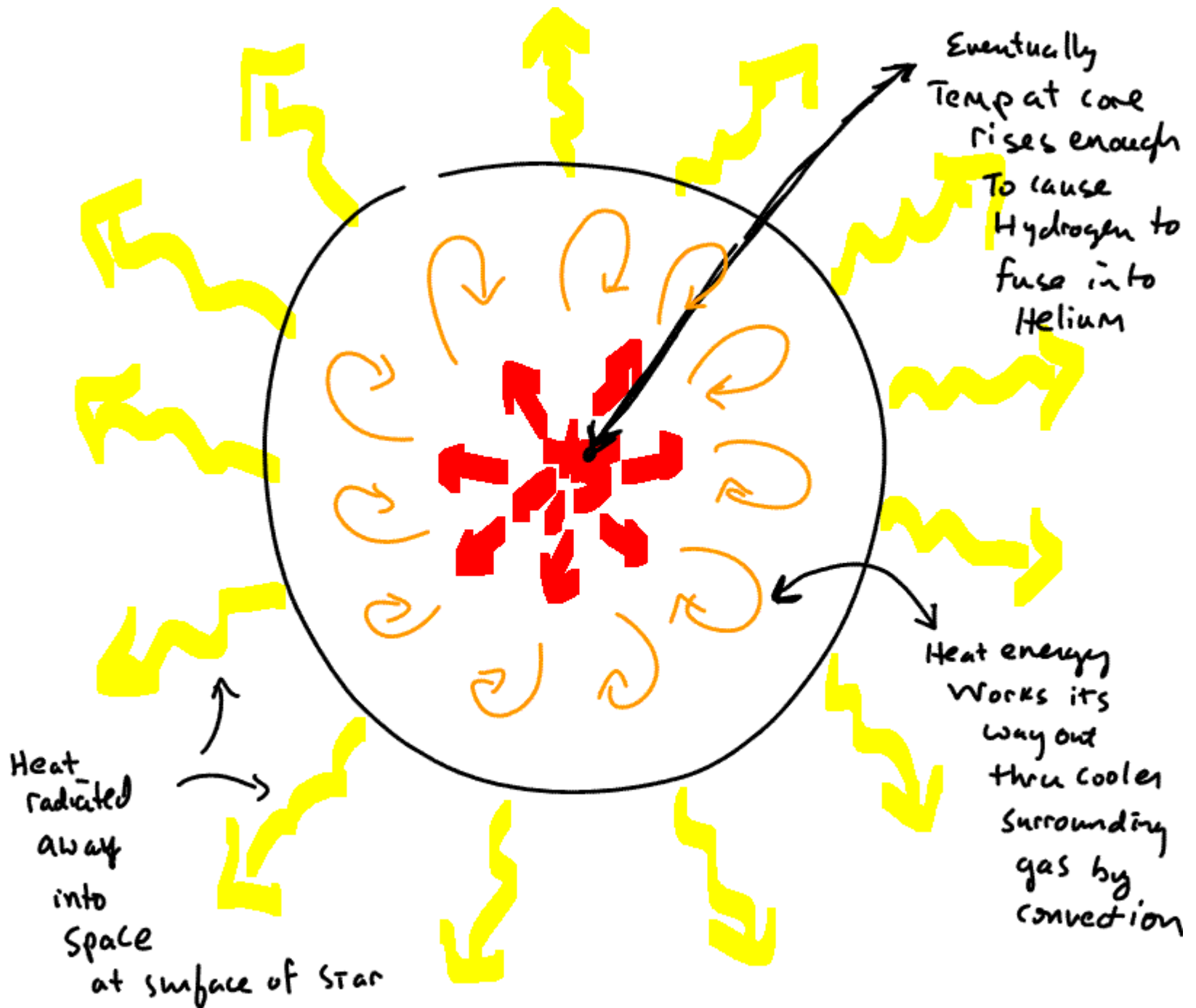
The Pleiades

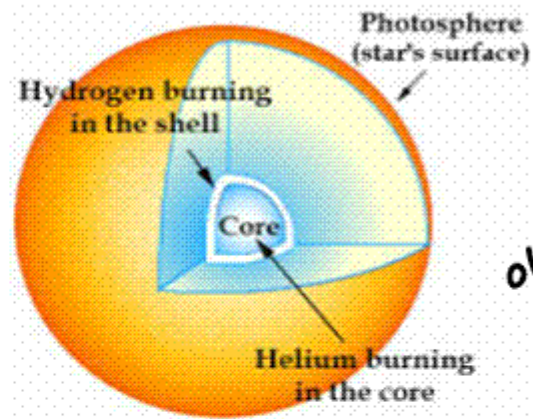
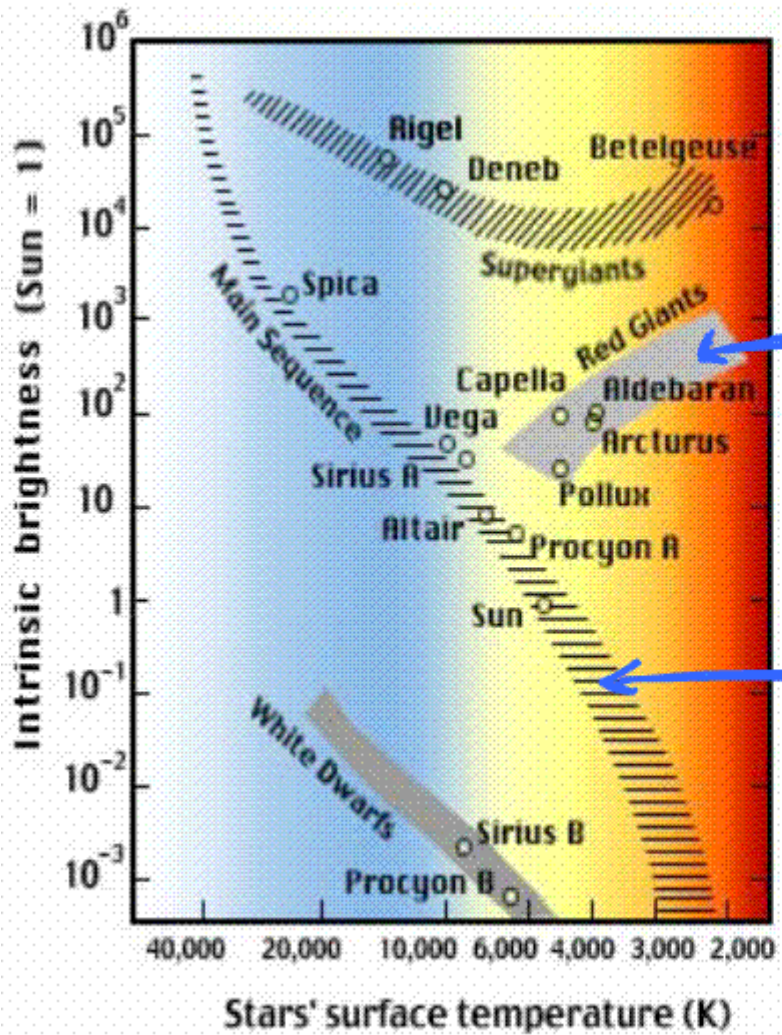
Young stars residual dust
surrounding them

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

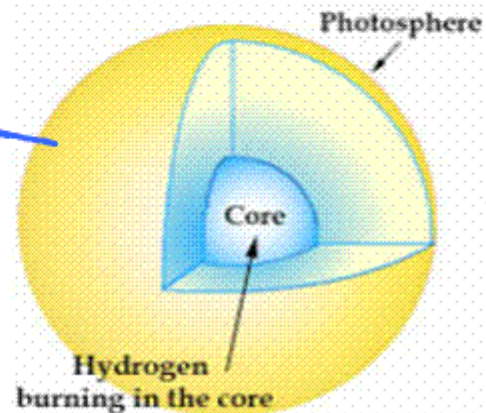


heat bleeds off
into space
and gas cloud gets
smaller ... heats
up some more.



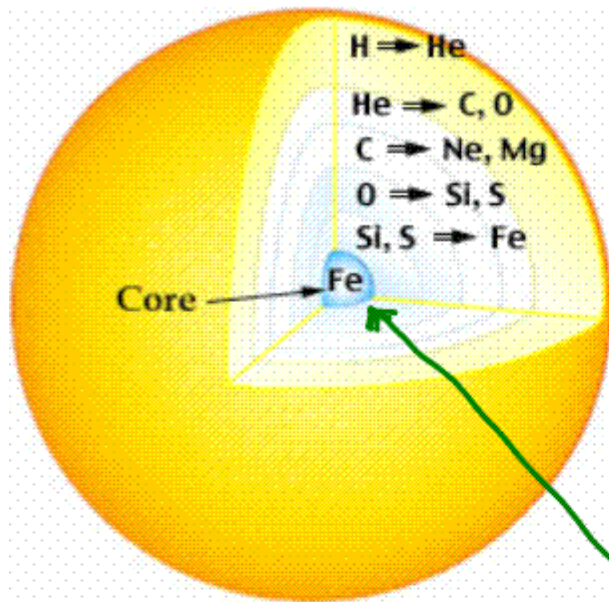


older



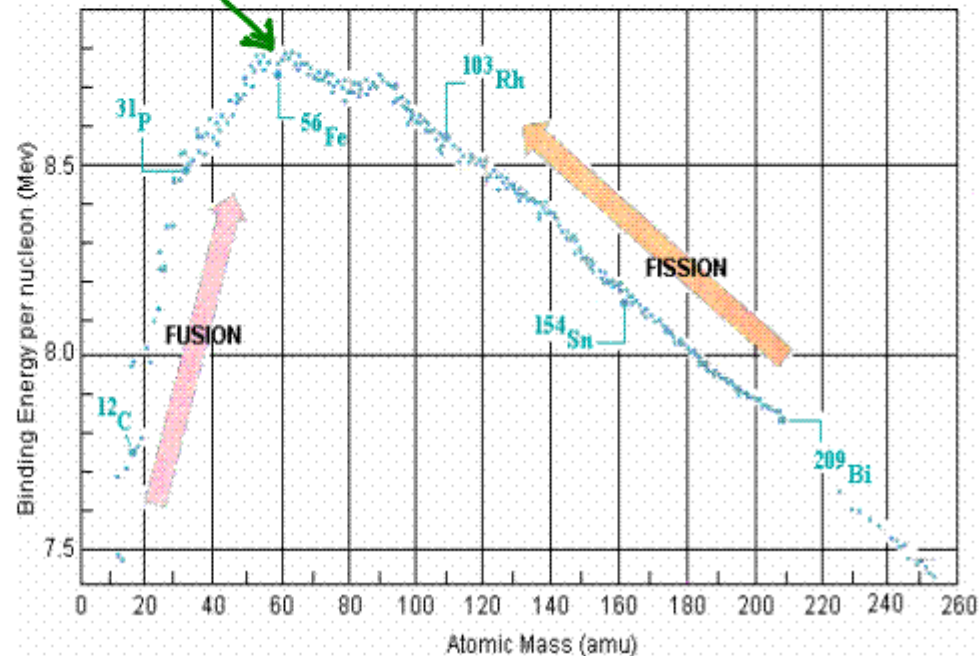
young





late l.f.e massive star

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



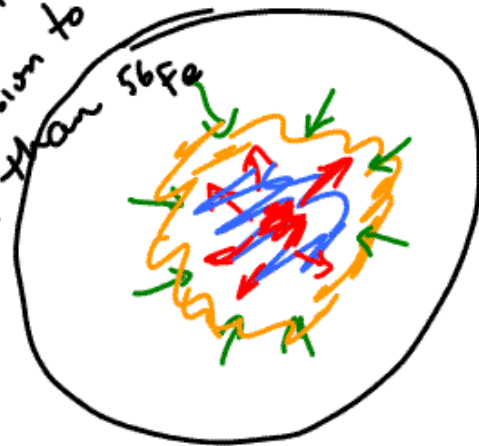
Very Schematic idea of Nova / Supernova



Fusion reactions cease in
core - outward
pressure reduced

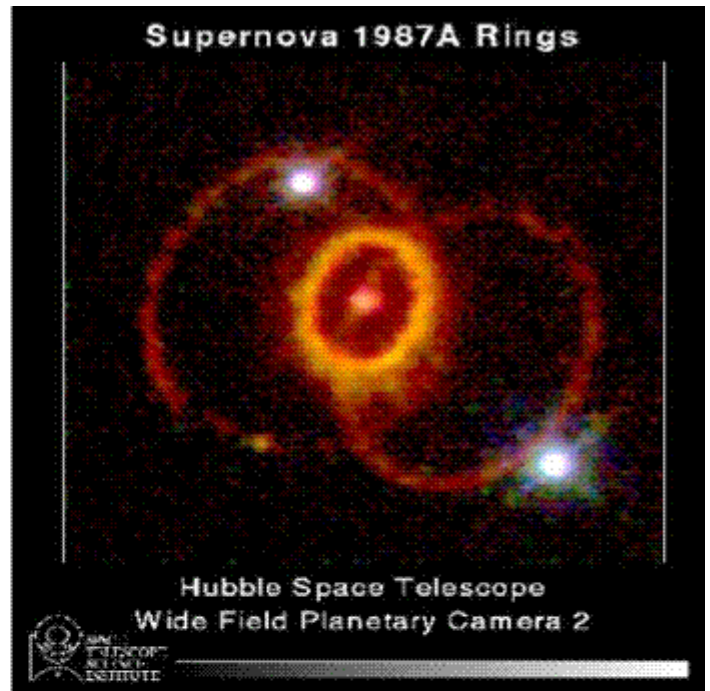
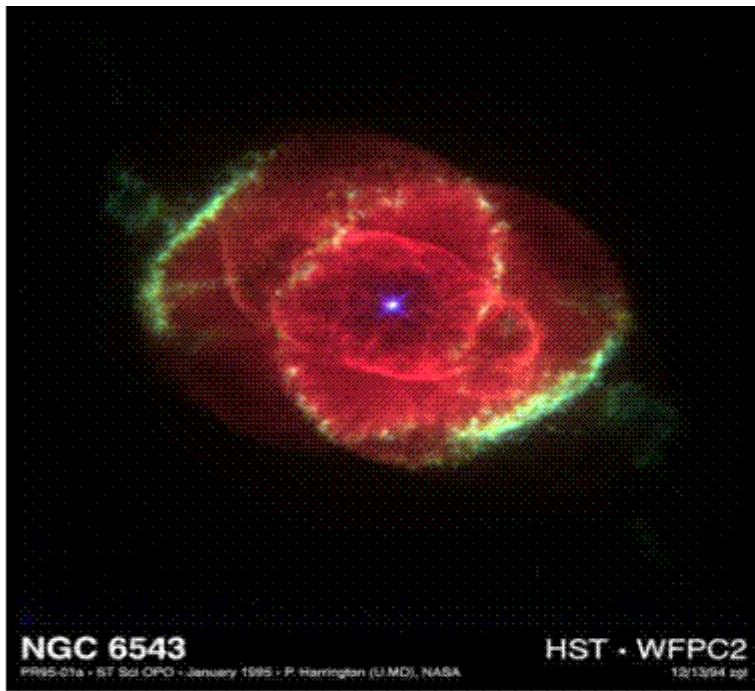
Shell begins to
collapse inward

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

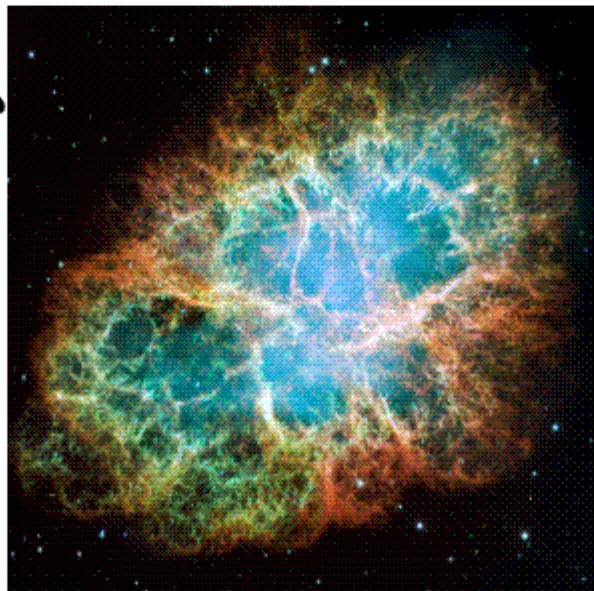


Core or inner part of
shell reignite
w/ fusion reaction
due to temperature
increase

Collapsing shell gets squashed between grav. motion in
and new burst of radiation pressure out
huge amt of fusion → explosive



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



Crab
Nebula
Star went
Supernova in
1054

