

Physics 100 - March 25, 2009

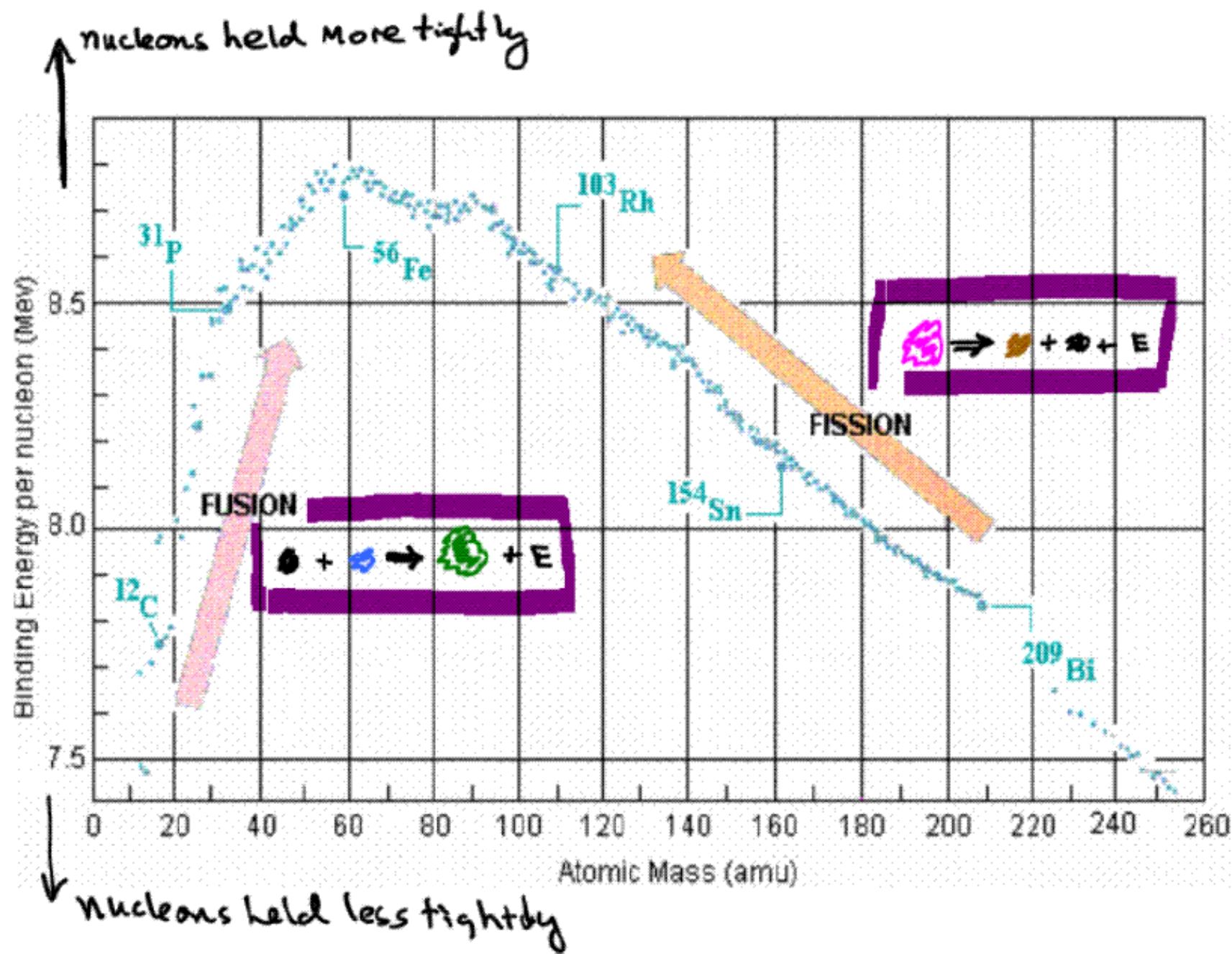
■ Presentation groups

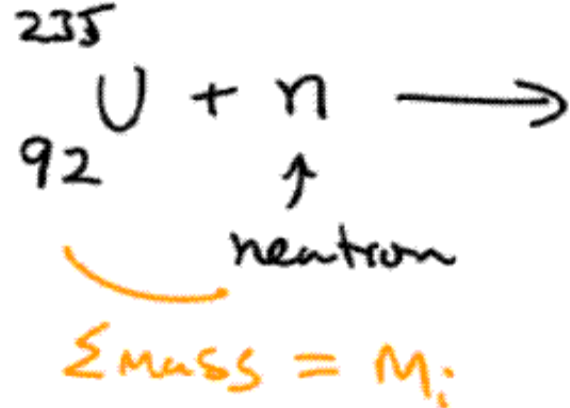
Meet + think about what you
might want to do

Determine "spokes person" for group

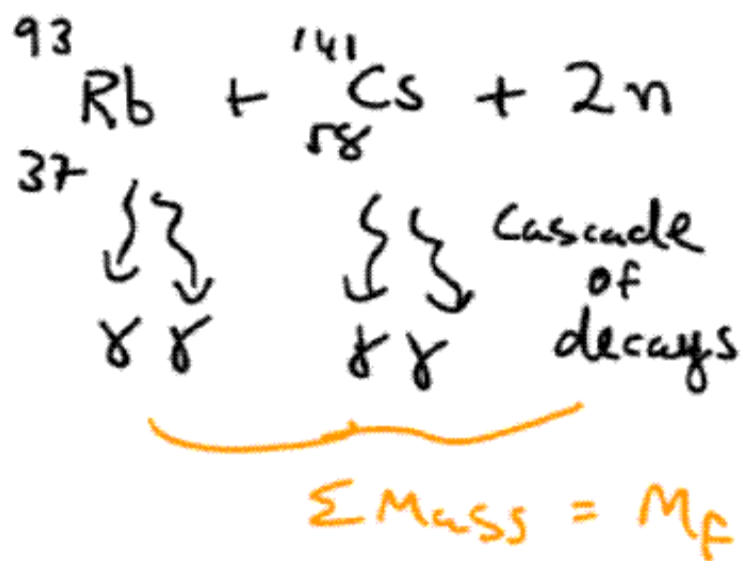
Contact me + set up a meeting

Inherent Nuclear Stability as Function of Nuclear Size

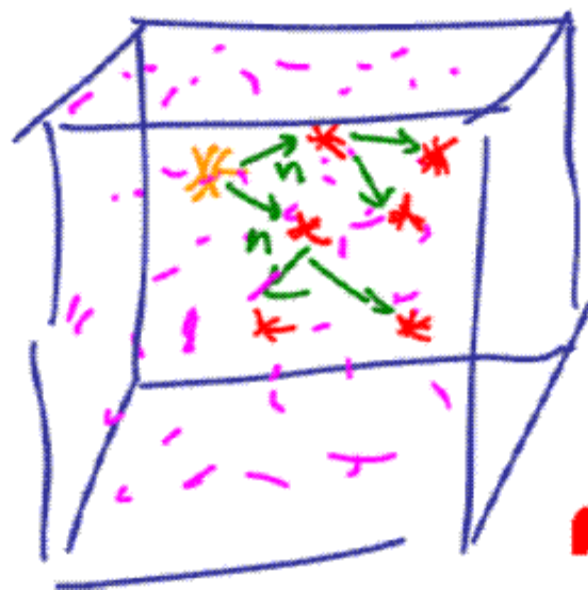




nuclear fission
 $E = mc^2$

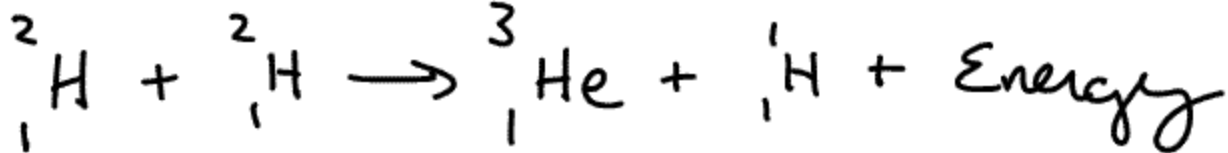


$$M_f - M_i > 0$$



Chain Reaction

- Critical 1 split for split
- Subcritical < 1 split per neutron (split)
- Supercritical > 1 split per split



ATOM.2 Bombs
" Fission



Thermonuclear bomb
(uses fusion)

Tritium
Deuterium

Inertial confinement fusion

Fusion in lab on Earth

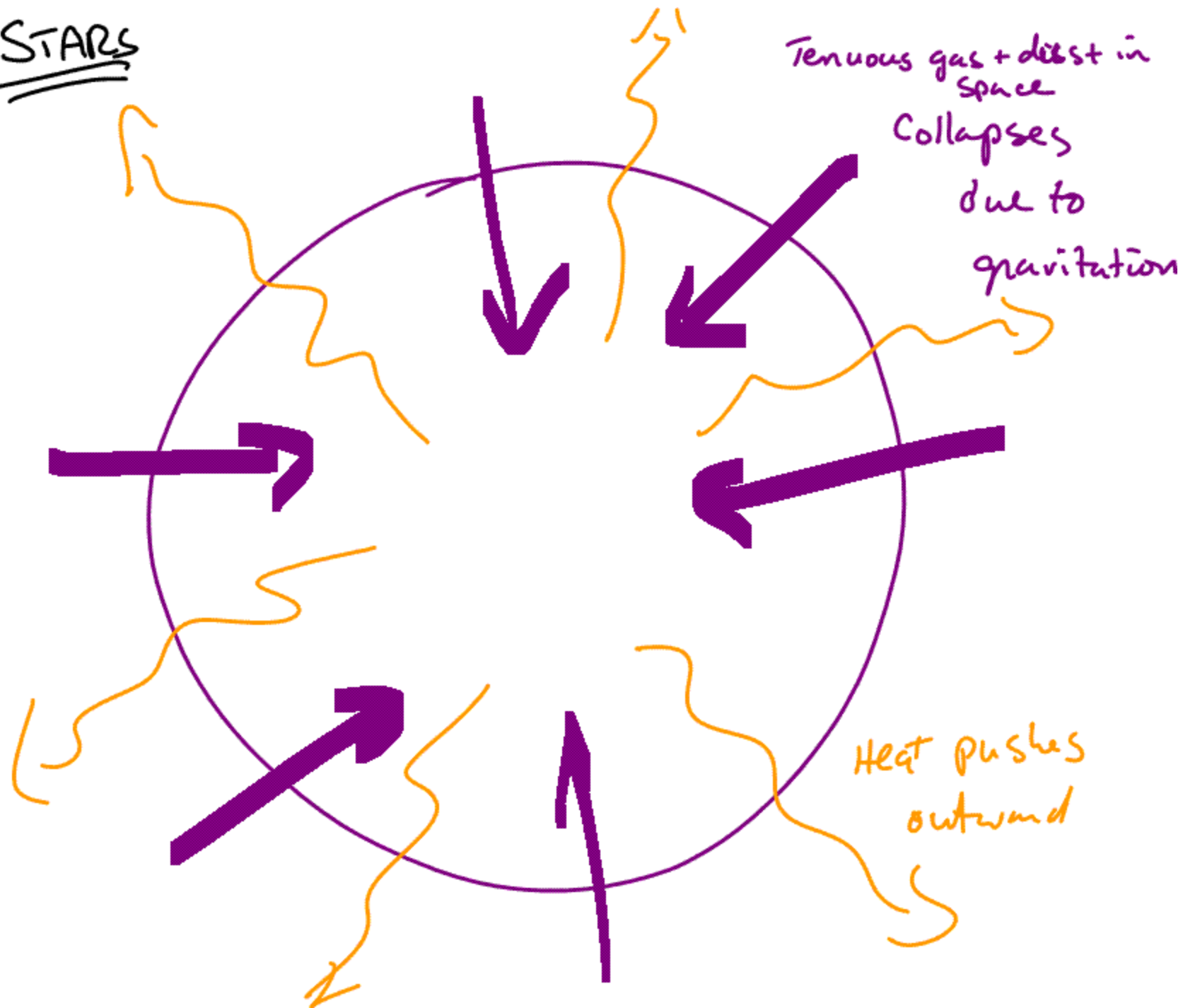


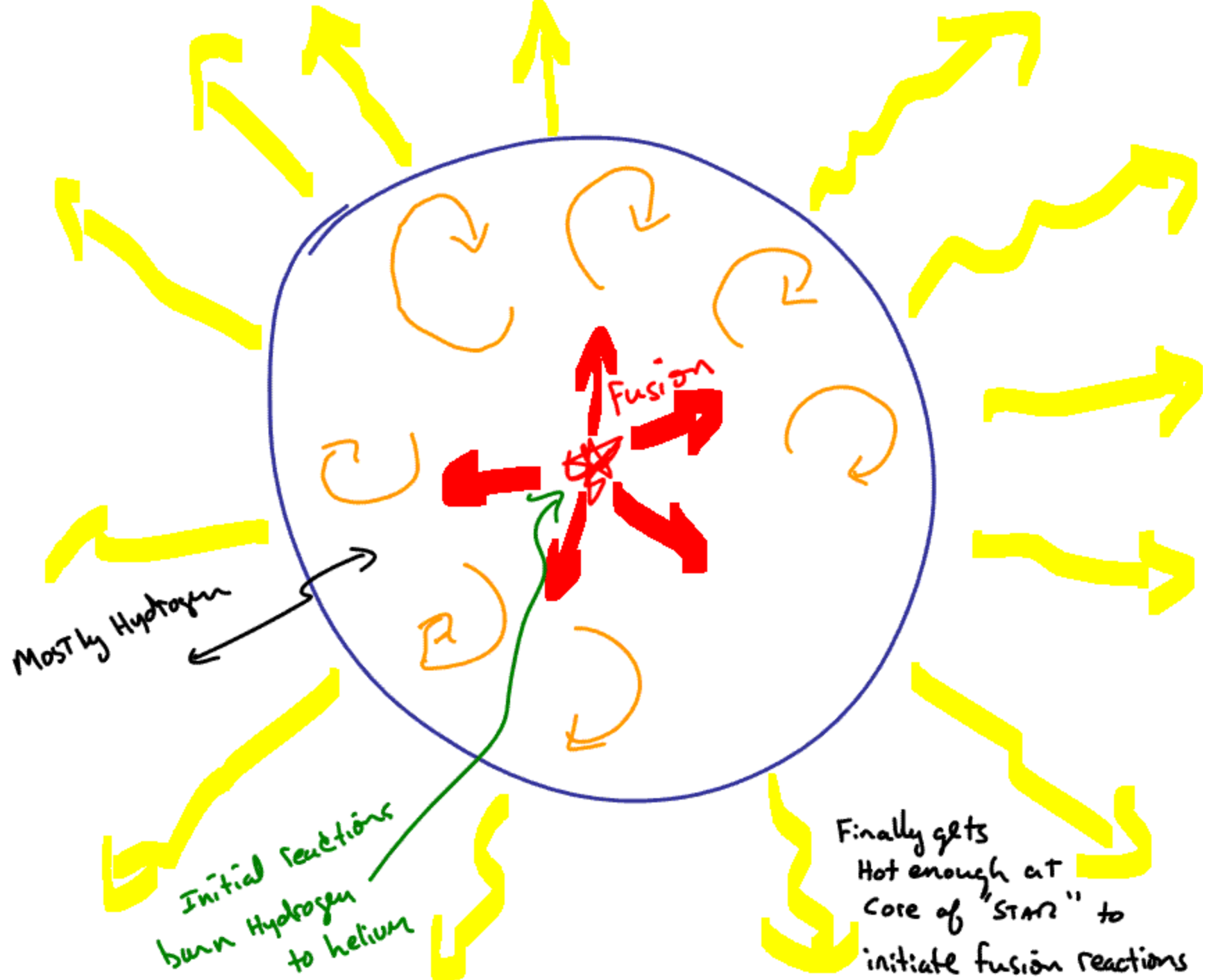
NIF = National Ignition Facility

Hot Plasma = "Tokamak"

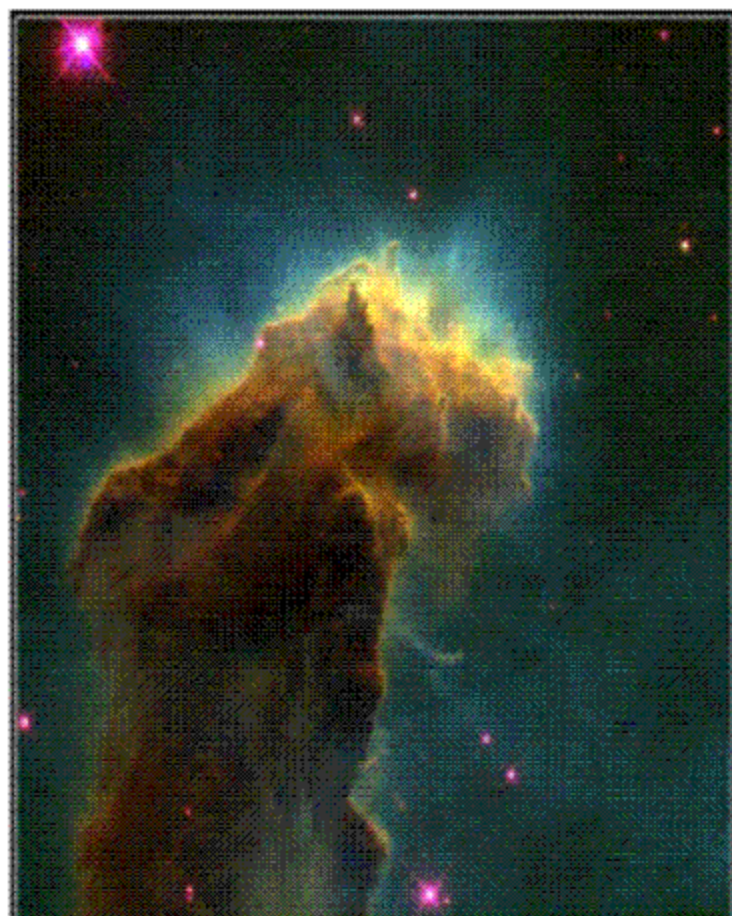


STARS





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

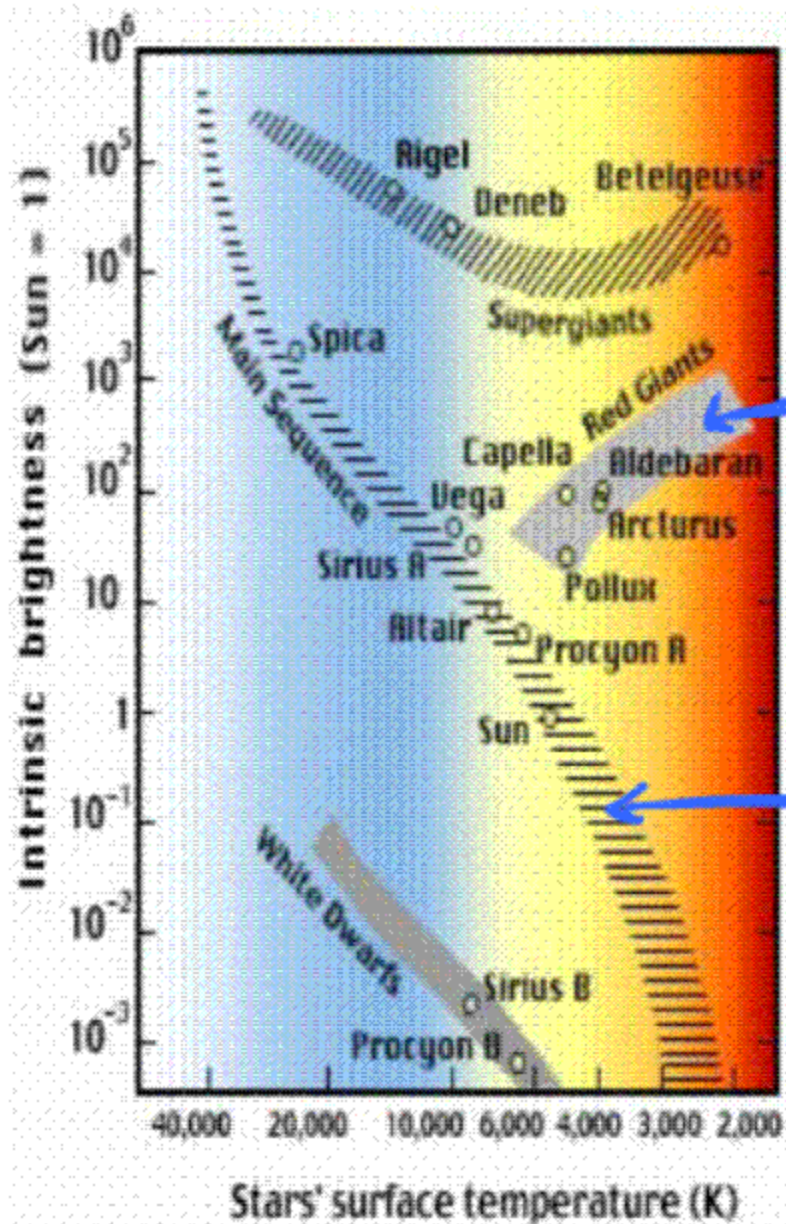
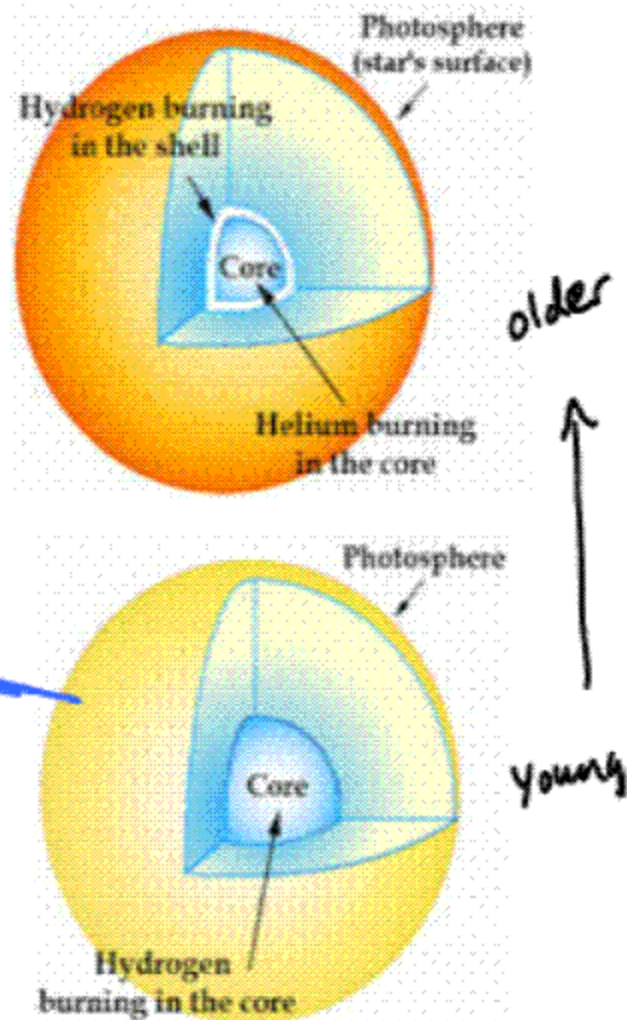
Stars Form From
Condensation of gas/dust
due to gravitation

mostly hydrogen gas

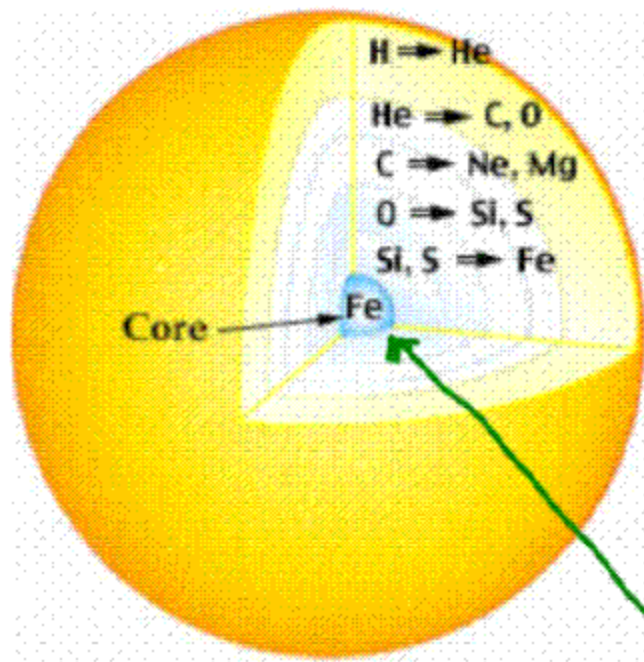


The Pleiades

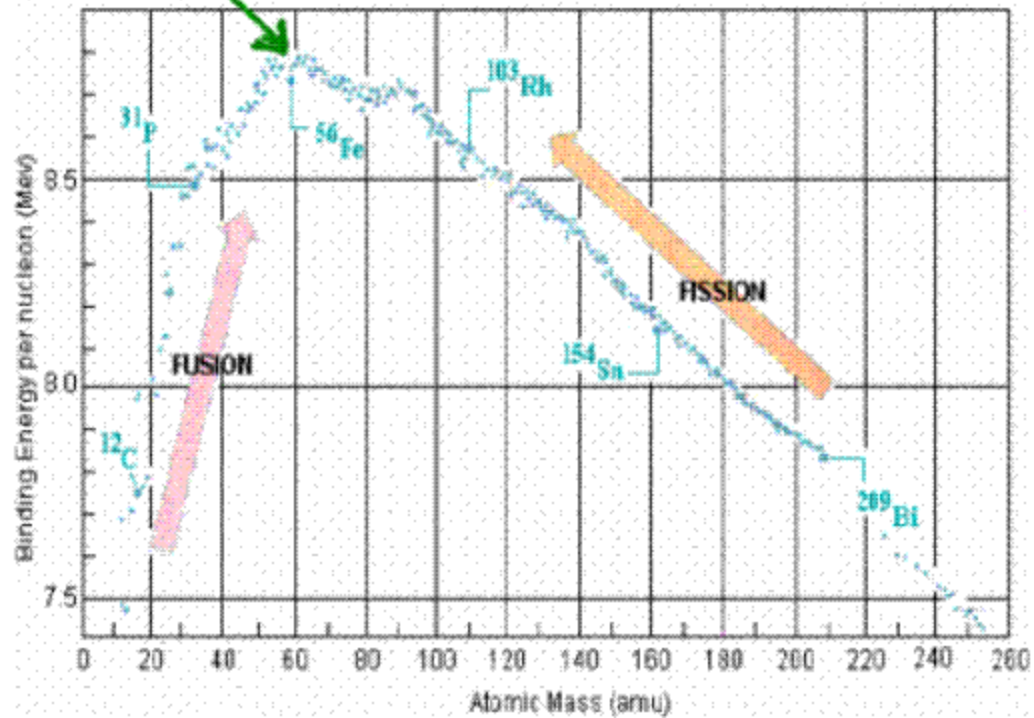
Young stars residual dust
surrounding them

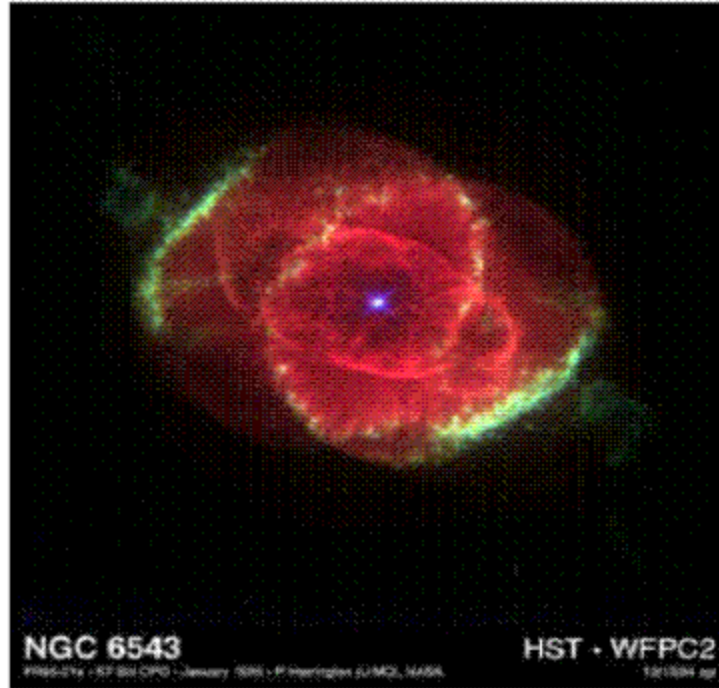
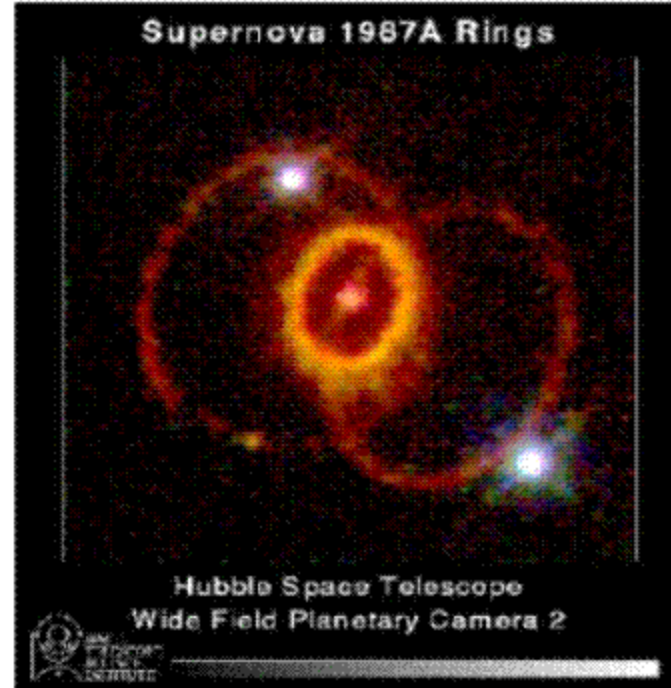


late l.ife massive star

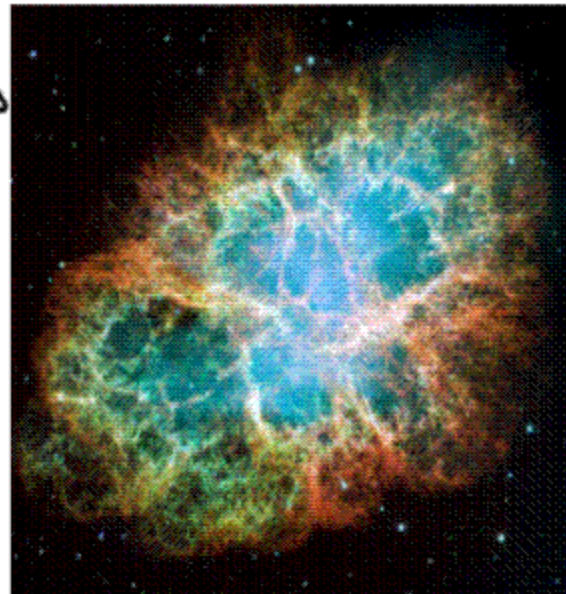


Fusion process into nuclei
larger than ^{56}Fe takes
energy rather than releasing
energy





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



Crab
Nebula
Star went
Supernova in
1054

Elements with Atomic mass $<$ that for iron $A=57$ can be made in Stars via fusion

How do we get elements with $A > 57$?

And how do these materials get dispersed into space to become part of other stars + planets?

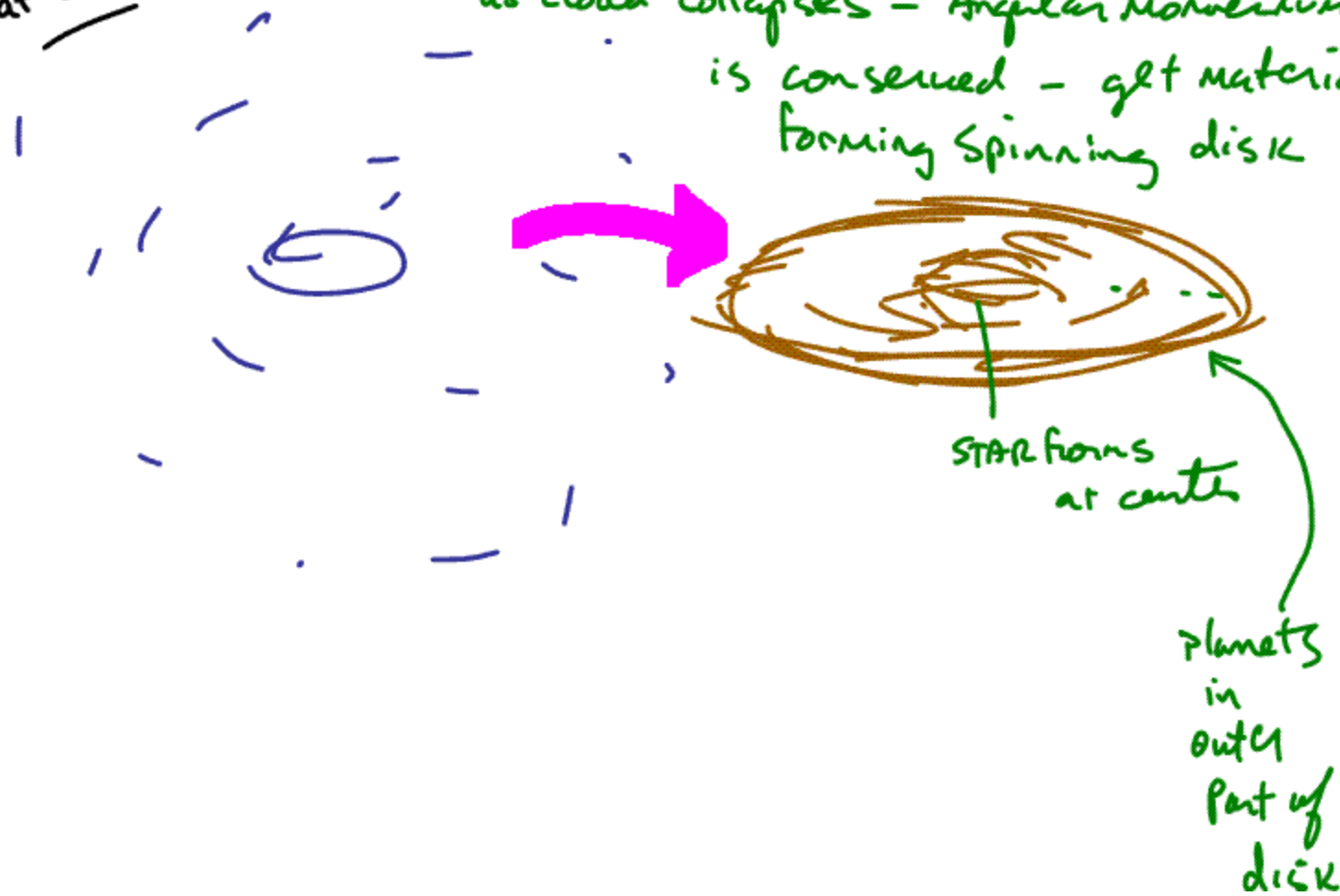
Nova
+

Several types
Still active
area of research

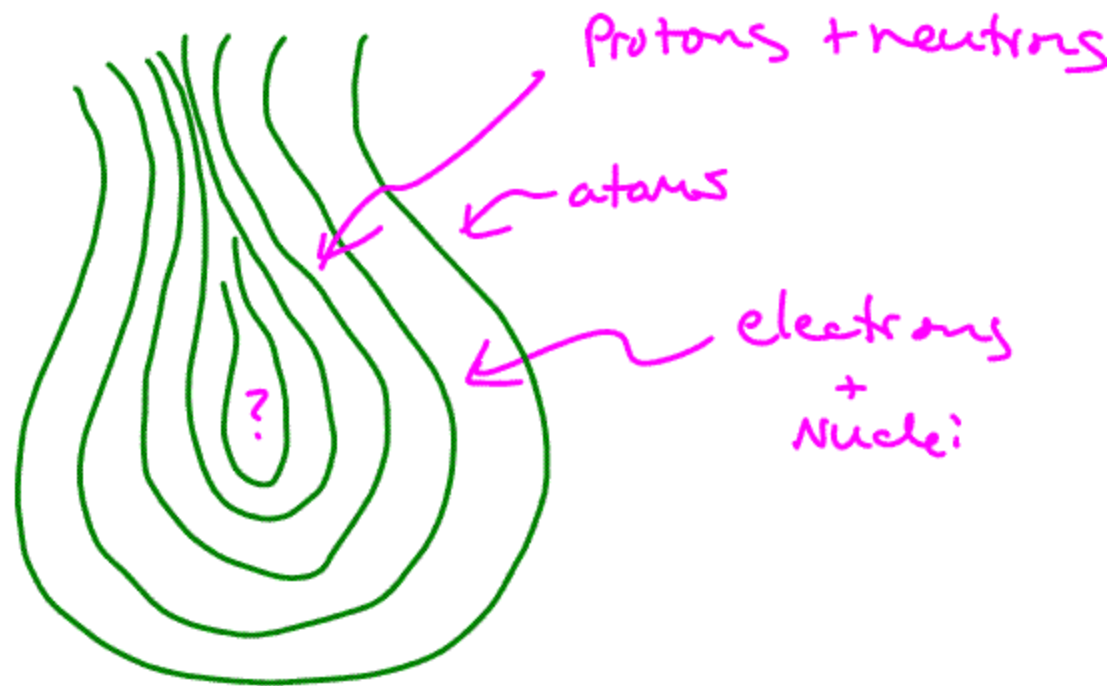
Supernova → as core of massive star cools down can have instability — core can collapse due to gravity and then slow or rebound as reach the point where "held up by particles". Shockwave can propagate and ignite the outer layers of STAR
→ Massive explosion
→ Produces heavy elements + disperses material in space

at birth

as cloud collapses - Angular momentum
is conserved - get material
forming spinning disk



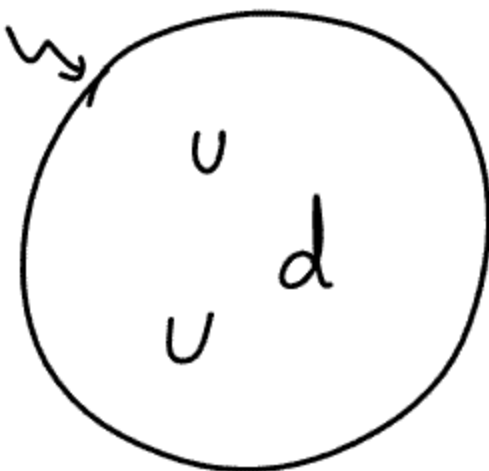
Nature's
onion



Let's continue our push into "inner space"

Structure within
the proton

Proton



quarks

up quark $q = +\frac{2}{3}|e|$

down quark
 $q = -\frac{1}{3}|e|$

STANDARD Model of Particle Physics
→ will discuss Next time