LEFT SIDE	
Row	Group
A	A
B	B
C	C
D	D
E	E
F	F
G	G
H	H
J	J
RIGHT SIDE	
Row	Group
A	K
B	L
C	M
D	N
E	P
F	Q
G	R
H	S
J	T
K	U

Group					
A	Carter, C.	Davis	Torobaev	Jarman	Harhausen
B	Grizzle	Fontana	Henry	Zhao	Moebius
C	Pendergraft	Ambala	Brown	Von Ruecker	Ford
D	Quick	Houser	Craven	Crook	Kliethermes
E	Bruhn	Leroux	Patterson	Parmentier	Foerstel
F	Spies	Hankinson	Proctor	Church	Malone
G	Dotson	Hurley	Bell	Stock	Melvin
H	Stulce	Angel	Kish	Riley	Howald, B.
J	Rushing	Lilly	Kreienkamp	Wilson	Grossner
K	Moralez	Howard, D.	Martin	Meyer	Edwards, S.
L	Trussell	Phelps	Schmidt	Colvin	Garcia, A.
M	Sula-Goff	Diel	Bates	Anness	Stephens
N	Boyer	Forbeck	Camareno	Hansen	Morgan
P	Huffman	Lee	Gianino	Irwin	Minor
Q	Drainer	Martinez-Tulais	Garcia, G.	Harles	Haley
R	Wigham	Miller	Phillips	Chevis	Edwards, A.
S	Geringer	Maldonado	Sidrim	Tull	
T	Marks	Ymker	Campos	McCray	
U	Sharp	Thomas, H.	Smith	Alspach	

Protostars: gravity

Main Sequence: fusion H → He in their cores

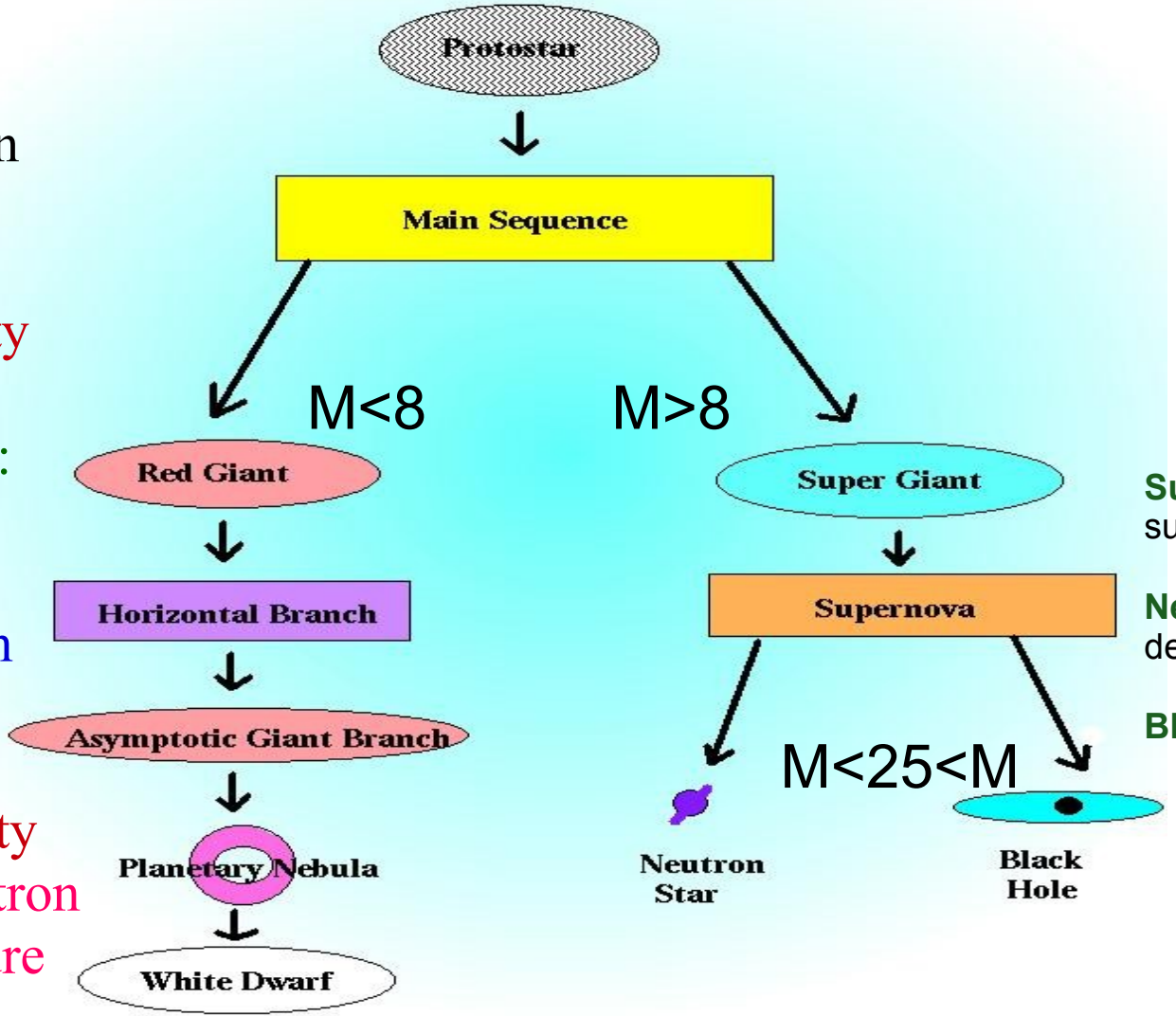
Red giants: gravity

Horizontal branch: fusion of He → C

AGB: energy from gravity

Planetary nebula: energy from gravity

White dwarf: electron degeneracy pressure



Supernova: collapse, no support.

Neutron Star: neutron degeneracy pressure.

Black hole: no support.

End States of Stars

White dwarfs: electron degeneracy pressure. Earth-sized, $0.6M_{sun}$

Neutron Stars: neutron degeneracy pressure. City-sized, $1.4M_{Sun}$

Black holes: no support. Size is a point, but $R_{Sch}=3M$ (mass in M_{Sun}, R in km). Eventually black holes evaporate.

Take aways

Stars form in groups.

Most groups are not gravitationally bound, but the rich ones (globular clusters) are.

Take aways

Supernova have 2 types.

Type Ia are exploding white dwarfs and are always the same brightness. Great for determining distances!

1) What is the most common type of planet discovered?

A) Earth-like at Earth-like distances

B) Jupiter-like at short (Mercury-like) orbits.

C) Jupiter-like at long, (Jupiter-like) orbits.

D) Sized between Earth and Neptune with short orbits.

E) Earth-like at long, (Jupiter-like) orbits.

2) What supplies the support against collapse for a protostar?

A) Fusion H -> He

B) Fusion He -> C/O

C) Gravity

D) Electron degeneracy pressure

E) Neutron degeneracy pressure

F) Explosion (supernova)

3) What supplies the support against collapse for a neutron star?

A) Fusion H -> He

B) Fusion He -> C/O

C) Gravity

D) Electron degeneracy pressure

E) Neutron degeneracy pressure

F) Explosion (supernova)

4) What supplies the support against collapse for a main sequence star?

A) Fusion H -> He

B) Fusion He -> C/O

C) Gravity

D) Electron degeneracy pressure

E) Neutron degeneracy pressure

F) Explosion (supernova)

5) What supplies the support against collapse for a white dwarf star?

A) Fusion H -> He

B) Fusion He -> C/O

C) Gravity

D) Electron degeneracy pressure

E) Neutron degeneracy pressure

F) Explosion (supernova)

6) What supplies the support against collapse for a red giant star?

A) Fusion H -> He

B) Fusion He -> C/O

C) Gravity

D) Electron degeneracy pressure

E) Neutron degeneracy pressure

F) Explosion (supernova)

7) Order the groups of stars from youngest to oldest.

A) A,B,C,D

B) D,C,B,A

C) D,A,B,C

D) B,C, A,D

E) A,D,C,B

8) What is the Schwarzchild radius of a $16M_{Sun}$ black hole?

A) 0 (infinitely small)

B) 1.6 km

C) 16 km

D) 48 km

E) 92 km

9) How will a 10 MSun star end?

A) Supernova explosion

B) White dwarf

C) neutron star

D) black hole

E) It will go on forever as a main sequence star

10) In the HW image, what's the difference between stars near A and stars near B that causes them to be where they are in the HR diagram?

A) mass

B) distance

C) evolution

D) composition

11) In the HW image, what's the difference between stars near C and stars near B that causes them to be where they are in the HR diagram?

A) where they were ‘born’.

B) distance

C) evolution

D) composition

Pass your HW to the aisle.
Solutions posted on Friday after class.

Test 2 on Nov. 4.
Project 1 due on Nov. 4
It needs to be on paper.

Friday we will begin on Galaxies!

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H	H
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T	Marks	Ymker	Campos	McCray	
U	Sharp	Thomas, H.	Smith	Alspach	