10/4/04

Second Exam - Chapters 6, 7, this Friday, October 8

Review sheet will be posted soon

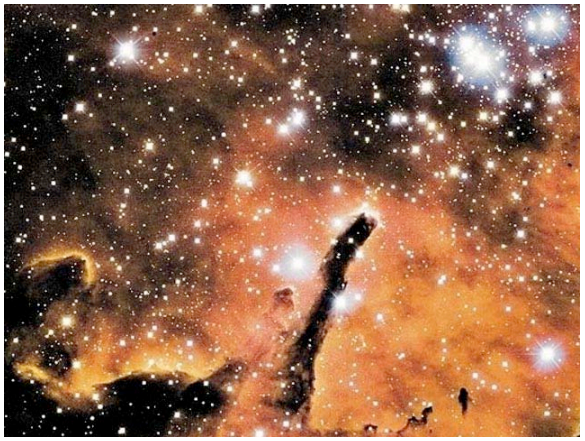
Office hours today, Wednesday, 2 PM

Review Session Wednesday, 5 PM RLM 15.216B

News? Rutan Rocket SpaceShip1 makes second flight, wins the X-prize

Pic of the day

Star formation



Fast explosion of C/O in Type Ia, shock hitting layer of Si in Type Ib, Ic make element closest to iron (same total p + n) with #p = #n

Nickel-56: 28p 28n <u>total 56</u> -- Iron-56: 26p 30n <u>total 56</u>

Ni-56 is unstable to radioactive decay

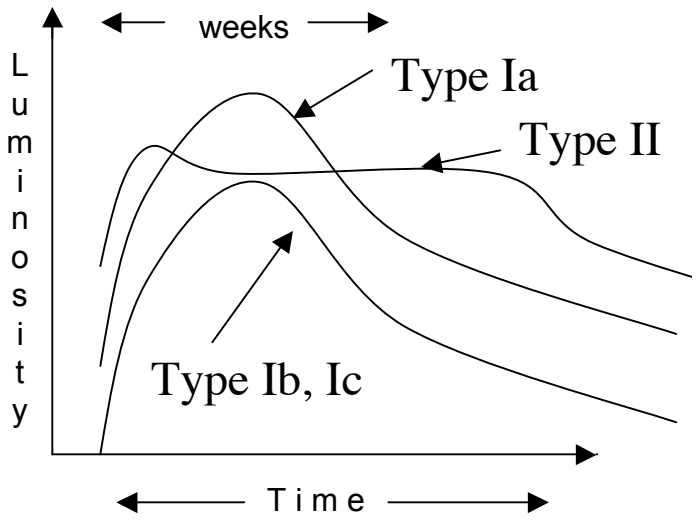
Nature wants to produce iron at bottom of nuclear "valley"

decay caused by weak force p $\rightarrow$ n

Nickel -56	γ-rays heat	Cobalt-56	γ-rays heat	Iron-56
28p	"half-life"	27p	"half-life"	26p
28n	6.1 days	29n	77 d	30n

Secondary heat from γ-rays makes Type I a, b, c shine

Light Curves



Type Ia: more nickel ~1/2 $M_\odot$ very bright (see further away!)

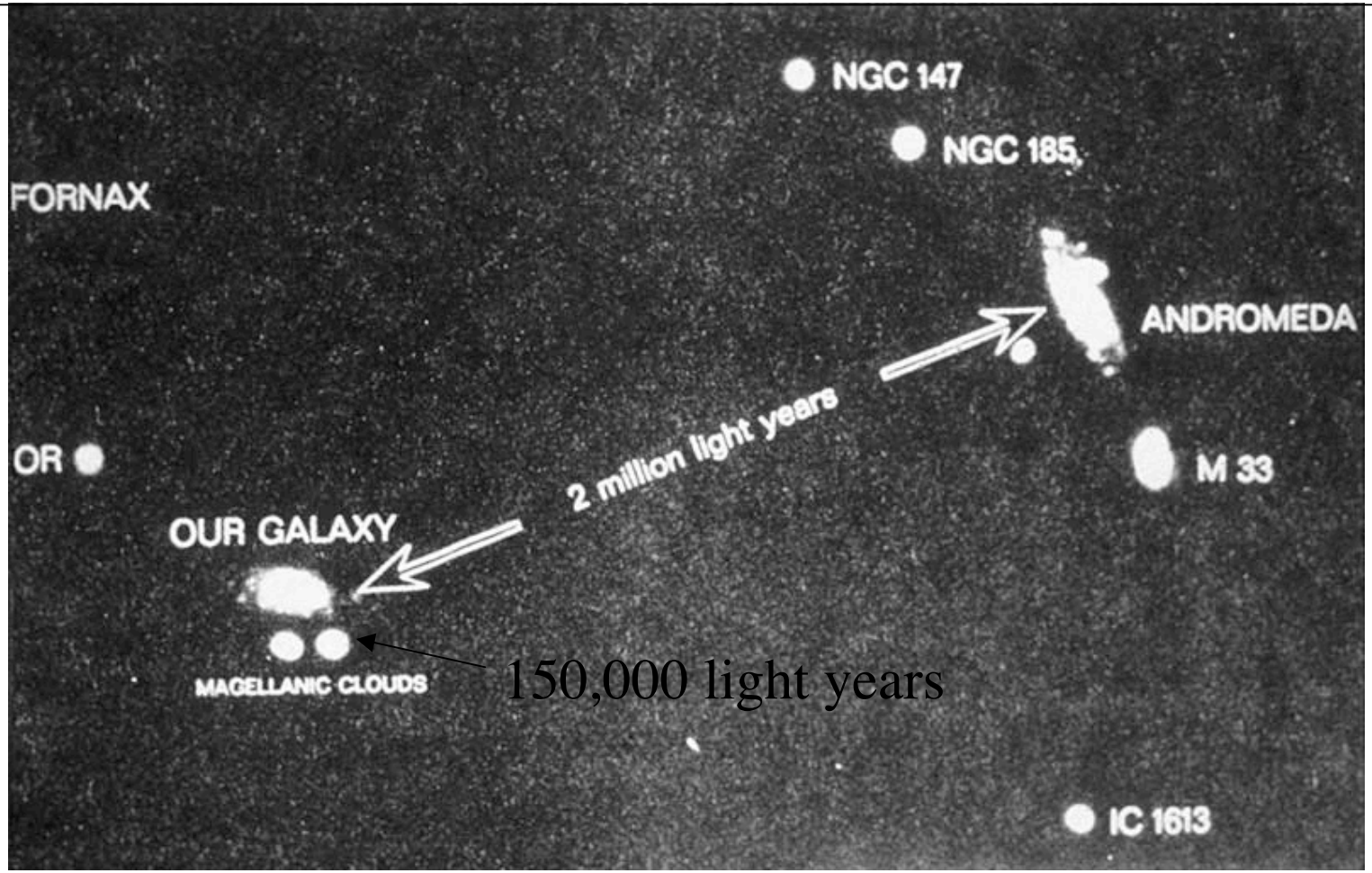
Type Ib, Ic, core collapse, shock Si layer ~ 0.1 $M_\odot$, dimmer overall than Type Ia, but similar shape

Same for Type II, core collapse, but do not see gamma ray heating until later, after the plateau, when the heat from the original explosion is dissipated. Nickel-56 will have decayed away, see only slower cobalt-56 decay

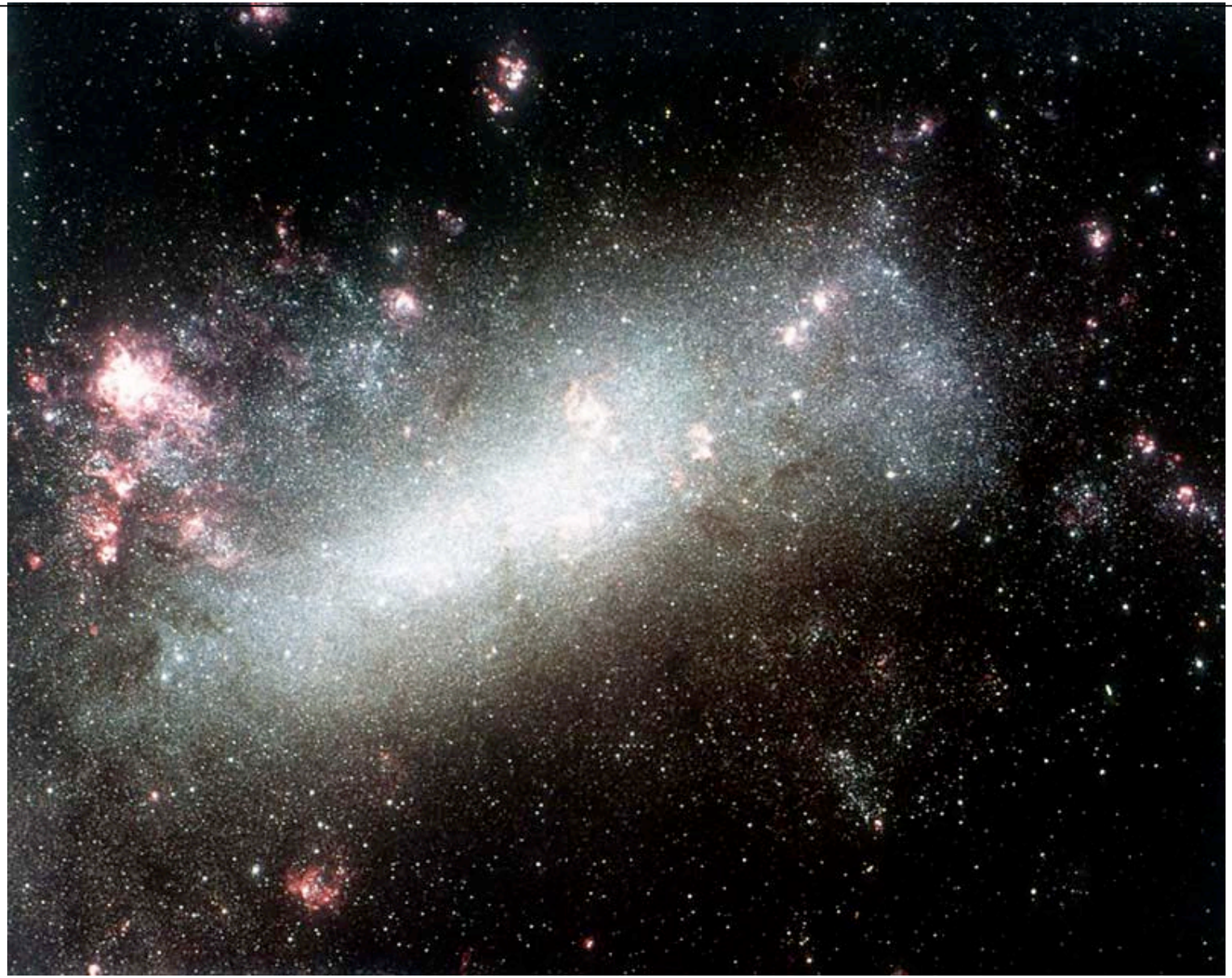
Kepler

Tycho

Local group


NGC 147
NGC 185
FORNAX
ANDROMEDA
OR
2 million light years
M 33
OUR GALAXY
MAGELLANIC CLOUDS
150,000 light years
IC 1613

LMC color



Rob McNaught patrol photos - the day before

2-22-87

The first known photo of SN 1987A hours after shock breakout

2-23-87

One day later

2-24-87

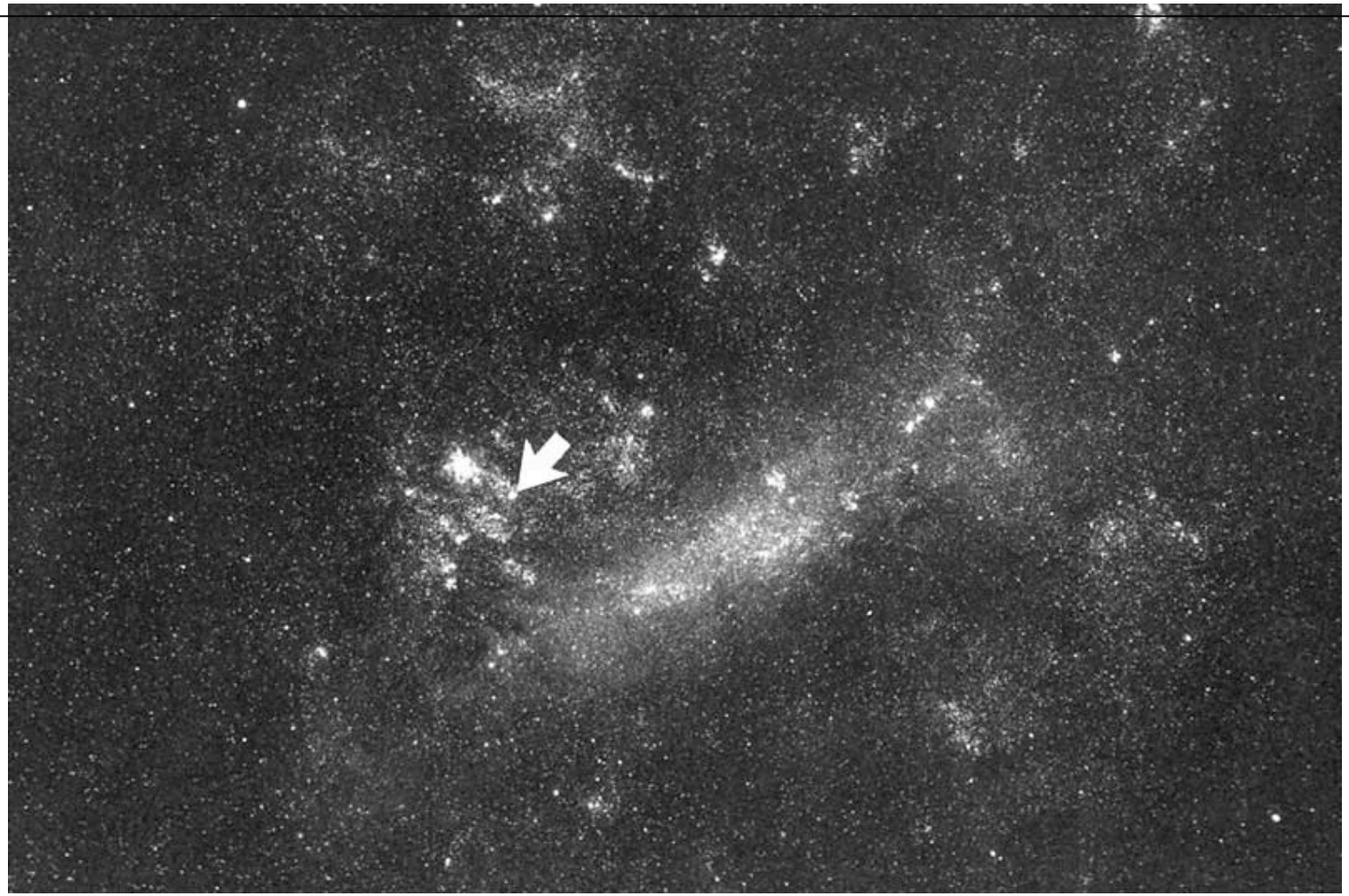
Near maximum light

5-20-87

About when I saw it

8-23-87

LMC w/arrow



LMC negative

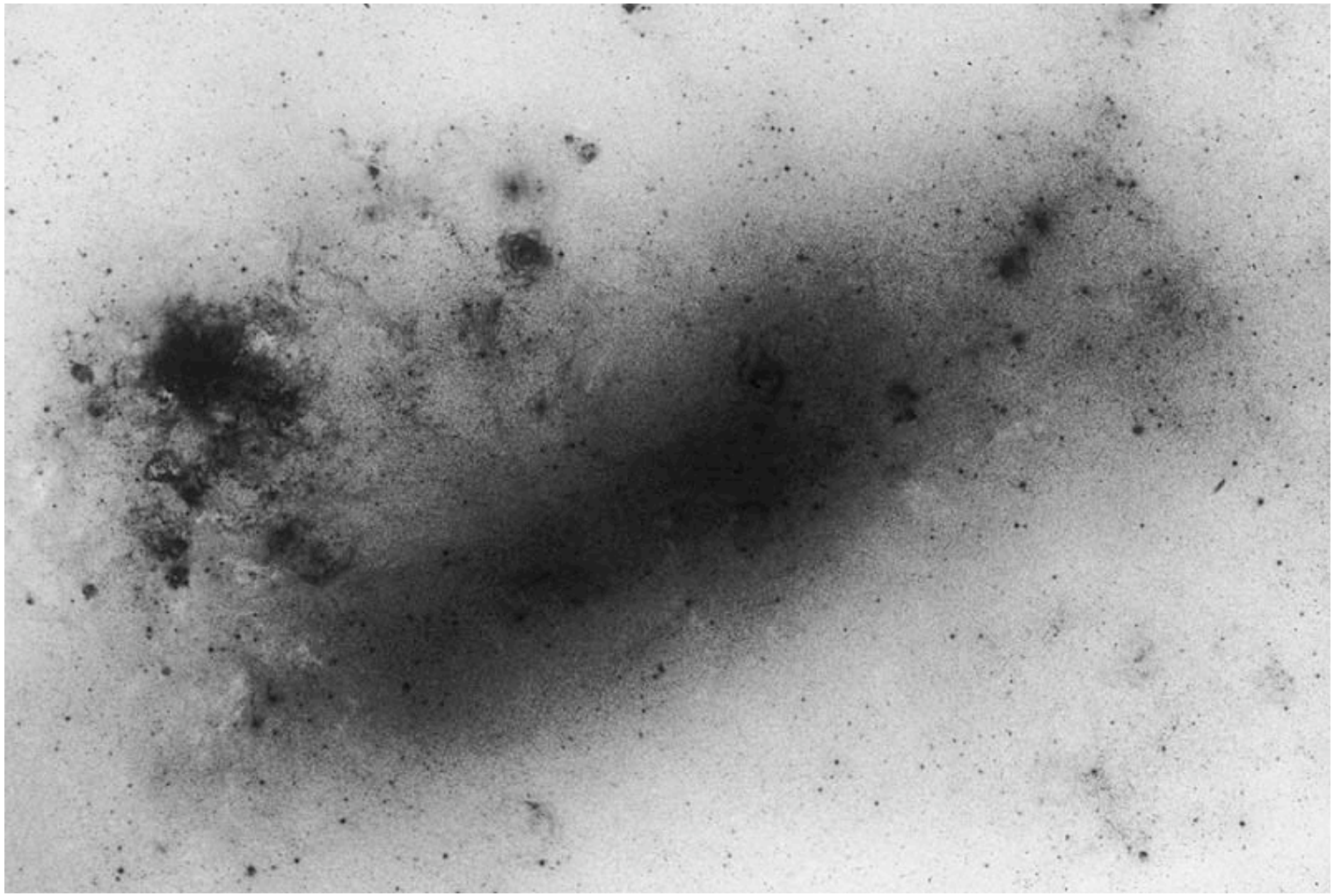
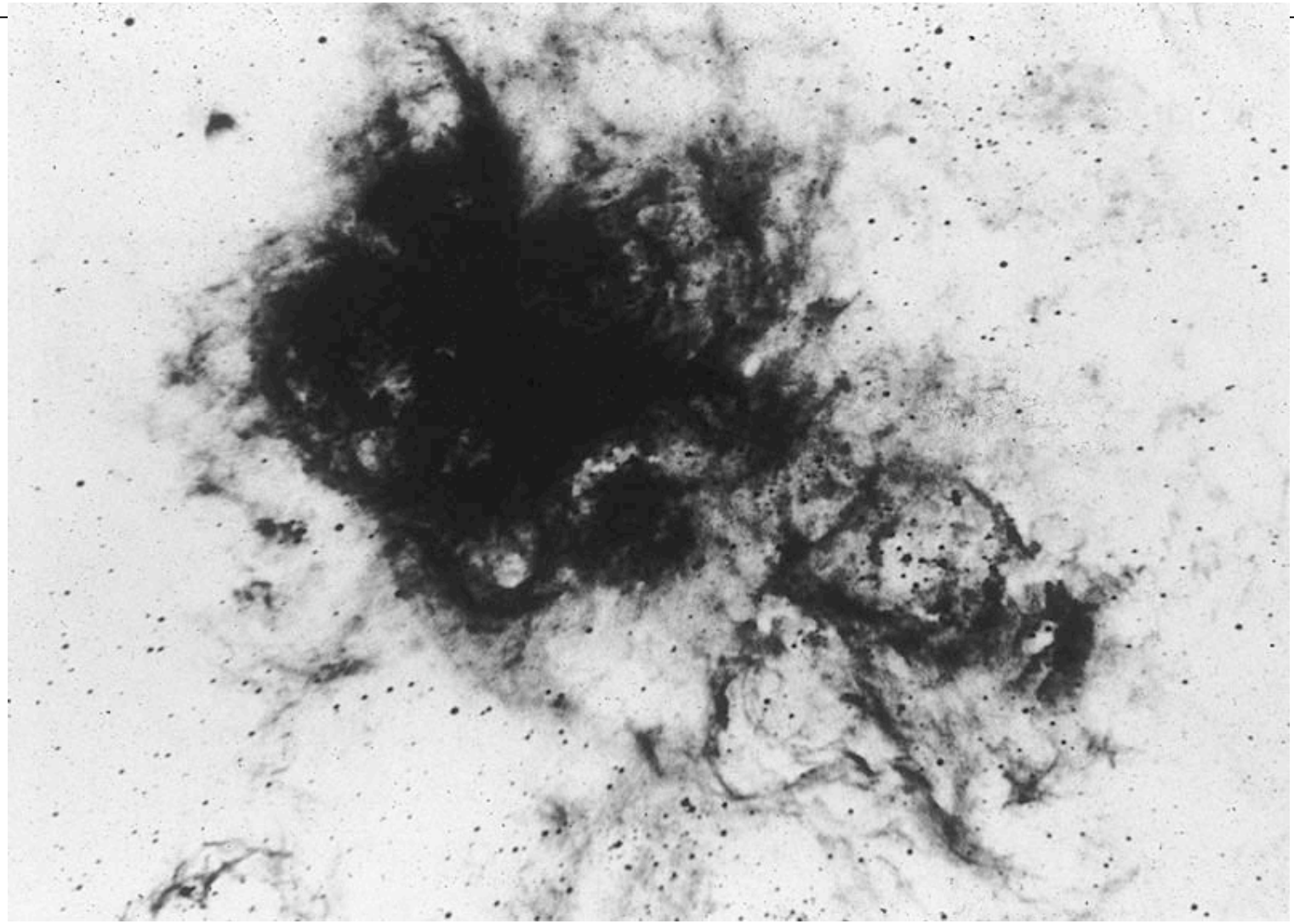
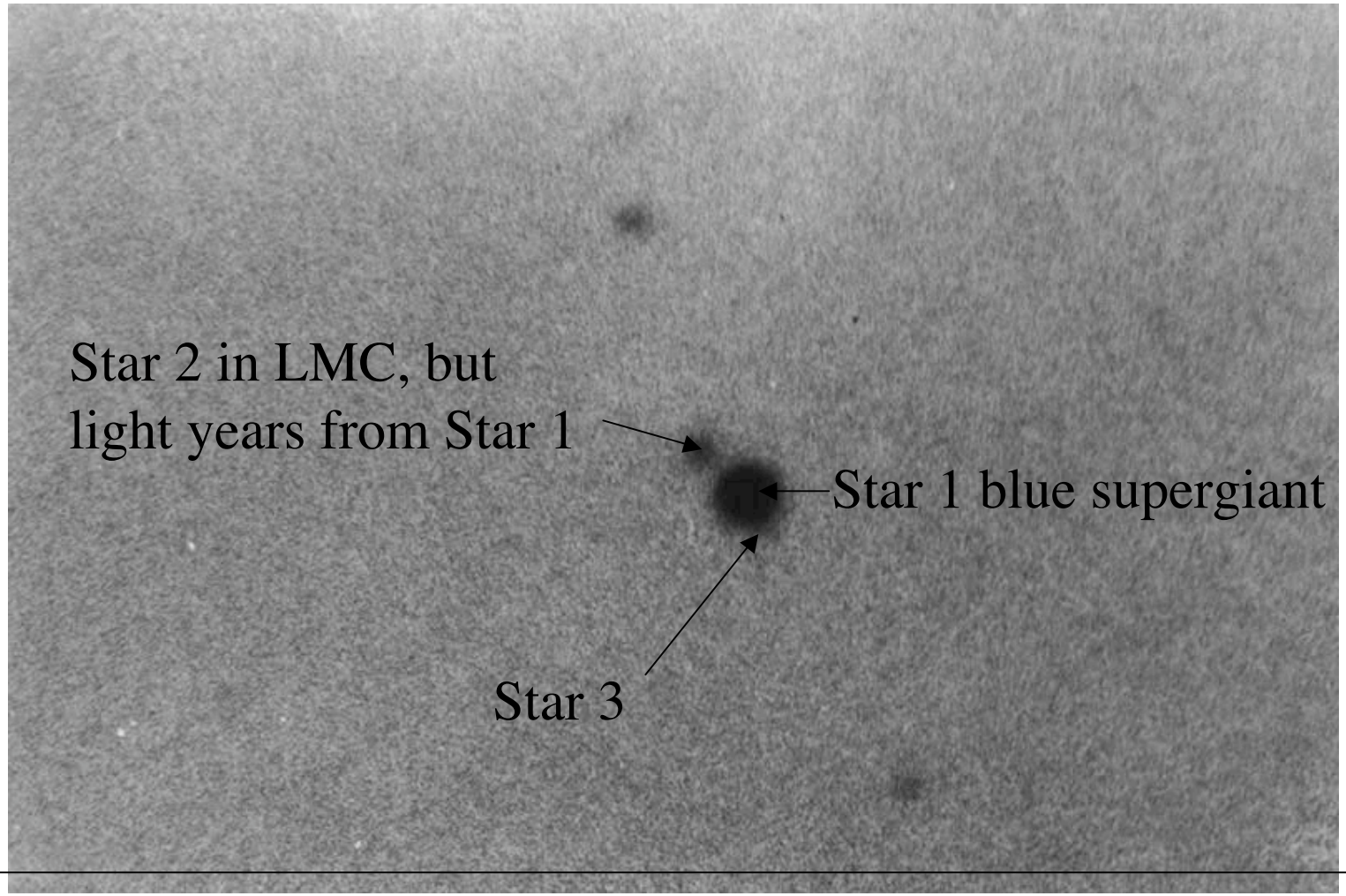


Photo of progenitor star (giraffe)



Stars 1, 2, 3



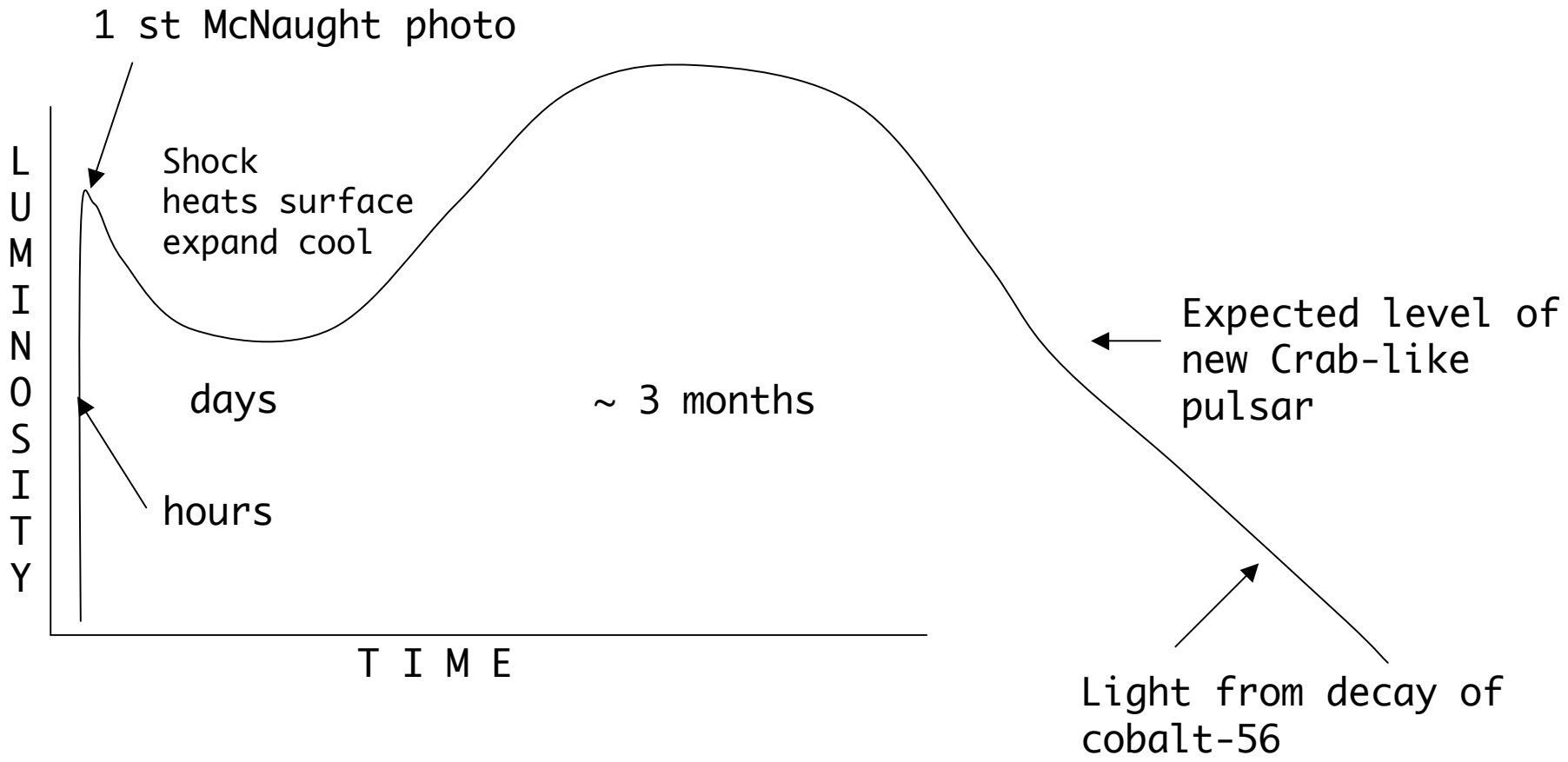
Close-up

The single most important thing about SN 1987A is that we detected the neutrinos!

It was definitely a core-collapse event

10^{57} neutrinos emitted, most missed the Earth. Of those that hit the Earth, most passed though since neutrinos scarcely interact.

About 19 neutrinos were detected in a 10 second burst.



SN 1987A had a rather peculiar light curve because it was a relatively compact blue supergiant, not a red supergiant, brief shock heating, rapid cooling by expansion, no plateau, subsequent light all from radioactive decay