

3/10/06

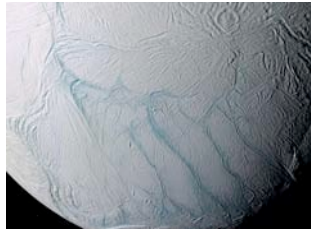
Reading Chapter 7, SN 1987A

Chapter 8, Sections 1, 2 (skip Sections 3, 4, 5), Sections 6, 7 (skip Sections 8, 9) Section 10, neutron stars

Chapters from second edition posted on web site.

News: Water geysers on Saturn's moon Enceladus

Pic of the day; Enceladus



Extra Credit (5 points in term grade, half a grade)

Evening:

Orion with Betelgeuse is moving East, have to look earlier in the evening (before 11 ish to see it). Don't wait until the end of the term to do this.

Sirius A, brightest star in the sky, has white dwarf companion.

Cassiopeia - Location of Tycho's SN 1572, Cas A (not naked eye, but direction)

Taurus - direction of Crab Nebula/Pulsar (near Mars)

Algol

Andromeda - Andromeda Galaxy

Aries - SN 2006aj/GRB060218 (very early evening then sets)

Monoceros - Black Hole X-ray nova, Nova Mon

Midnight:

Vela - Vela SN, pulsar

Virgo - Virgo cluster of galaxies, supermassive black hole in M 87, nearby bright supernovae.

Centaurus - neutron star binary Cen X-4

Morning:

Scorpius - U Sco, recurrent nova, possible future SN Ia

Cygnus - direction of Cygnus X-1, most famous binary black hole, V404 Cyg another black hole binary

Ophiuchus - Kepler's SN 1604, recent outburst of recurrent nova, RS Ophiuchus

Hercules - binary neutron star Her X-1

NEUTRON STARS (Chapter 8)

mass of Sun

radius ~ 10 km

density like atomic nucleus (even a few times more!)

gravity at surface huge - crush human

highest "mountain" ~ 1 foot

Pulsars - rotating magnetic neutron stars

~600 radio pulsars known

“active” for ~1-10 million years, then magnetic field decays or aligns → *no radiation*

Probably ~ billion “inactive” neutron stars ~1% of all stars in the galaxy

To radiate, pulsars must be magnetic:

Wiggle magnetic field ⇒ wiggle electric field
⇒ wiggle magnetic field ⇒ ***Electromagnetic radiation***

Simplest configuration North, South poles ***Dipole***
“lines of force” connecting poles

Magnetic axis must be tilted

If aligned, system is too symmetric to “wiggle”

Magnet, filings

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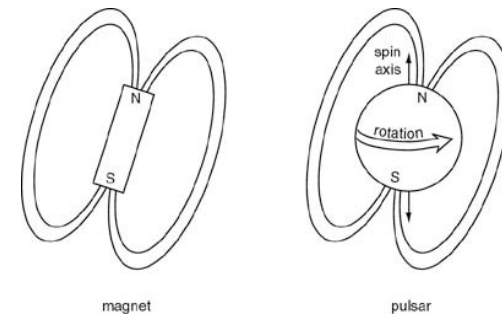
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Figure 8.1



Pulsars are rotating, magnetic neutron stars with magnetic axis tilted with respect to spin axis.

Radio emission from “sparks” “thunderstorms” at poles or “speed of light” cylinder

Poles: whip magnetic field around $\Rightarrow$ huge Electric fields create huge currents, “thunderstorms” $\Rightarrow$ radio “static”

Radiation is beamed from magnetic poles, see “pulses” by “lighthouse” mechanism

Flashlights

Most pulsars rotate about once per second, young ones faster, Crab pulsar 30 times per second - would rip apart anything but a neutron star