Radio astronomy notes

Remote sensing – optical traditionally, radio as technology evolved

Windows in spectrum 10 m → 10 mm λ, ~~vis~~ 0.4 – 0.8 μm, some IR 1 – 20 μm

Neutrinos, gravitons future possibilities

1931 – ~~Ex~~ Karl Jansky, Bell Labs

Looking for thunderstorm static

Built 30 m x 4 m antenna, λ = 14.6 m, 20.5 MHz, rotated each 20 min on a motorized platform

1) Local thunderstorms, 2) Distant thunderstorms, 3) Unknown source

1933 – Jansky locates source at 18 h r.a. + 10° S dec, ±30 min ± 20° – galactic center

Mistakenly thought sun not a source

Late 1930's provided first true radio telescopes and began sky surveys

1940 – Reber: sky map, Maxima in Sagittarius, Cygnus, Cassiopeia, Canis Major, Puppis.

also thought some emission from sun

WW II – British looking for Nazi planes to the east

1951 Hydrogen line at 21.1 cm (1420 MHz) found in galactic radiation

1960's larger telescopes, better resolution

Cygnus source localized, found to be very strong radio source coincident with optical nebula found by Mt. Palomar.

Optical Doppler shift gave distance of 200 x 10^6 light years – now 600 x 10^6 light years (galaxy is 10^5 light years)

Cygnus A has radiated power 10^{38} watts, strong radio but relatively weak in optical.

At 10x distance, still strong ~~opt~~ radio but hard to detect optically – so radio telescopes "see" farther than optical telescopes.

"Radio" and Optical galaxies (or normal) – Radio galaxies $10^3 - 10^5$ stronger than normal