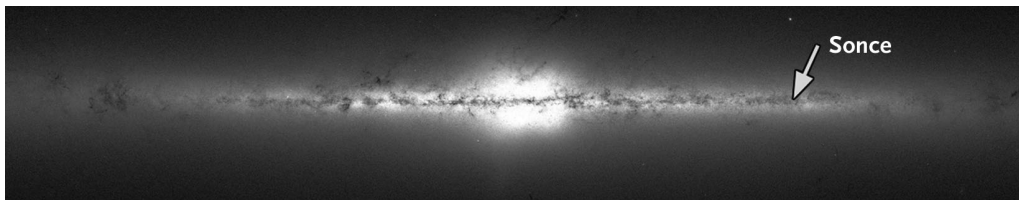
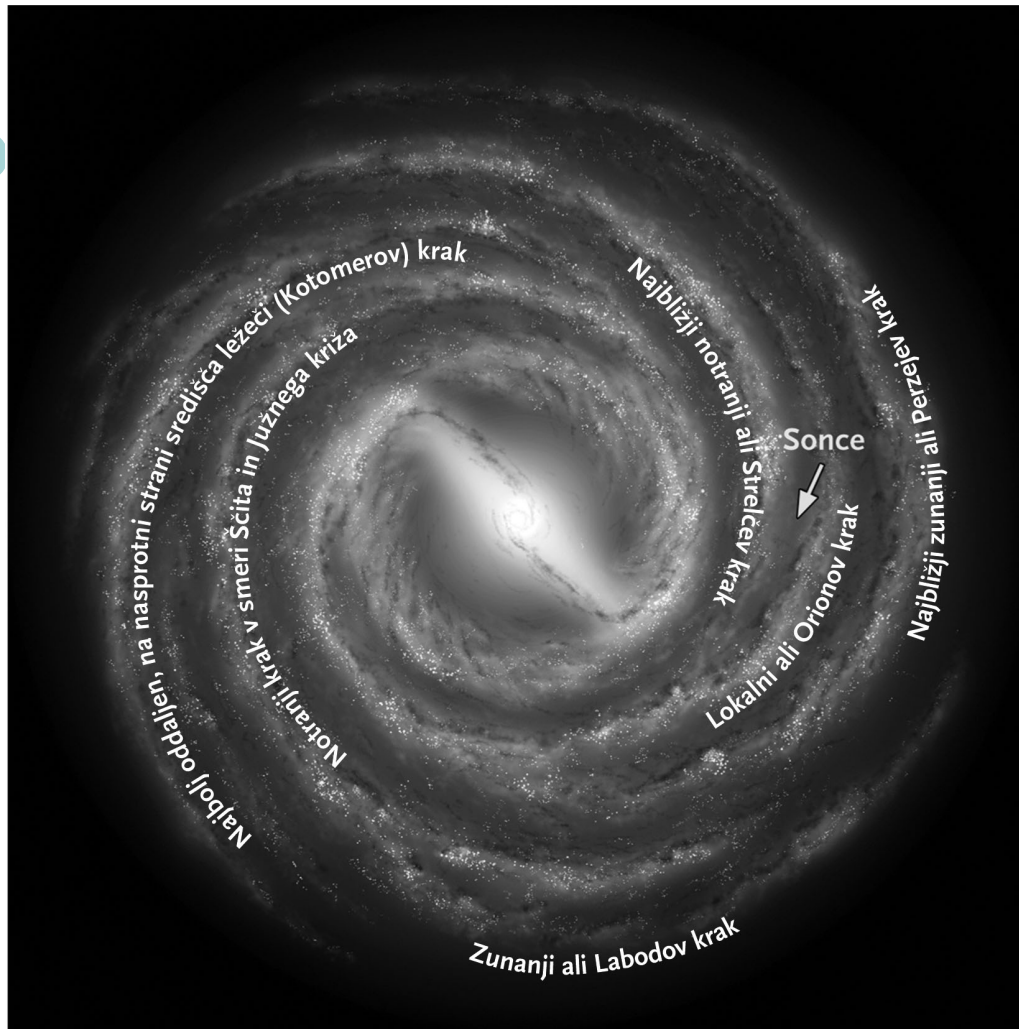




Začetki proučevanja Galaksije

Galaksija

spiralna galaksija s prečko



B. Kambič: Ozvezdja, 2007



naše mesto v vesolju?











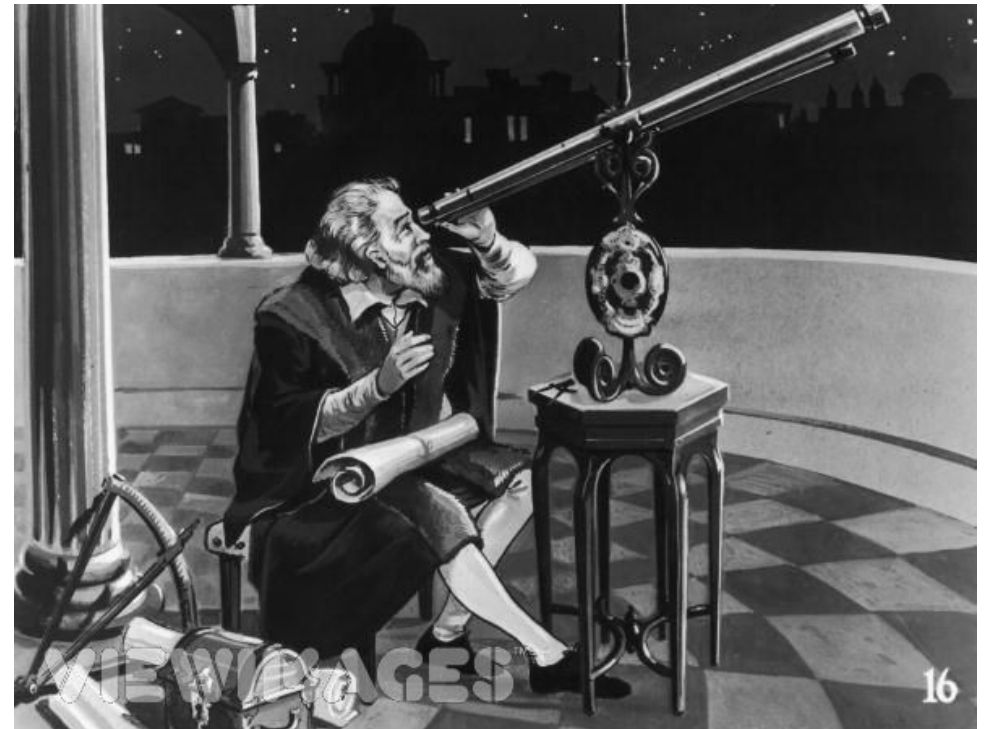
čreda krav
Herino mleko
ptičja selitvena pot
zimska cesta
nebeška
ali srebrna reka
pot belega slona
slamnata pot
dolga kanu
modri morski pes
pot bojevnikov
sled psa,
ki je ukradel moko



- stari Grki: Demokrit (460-370 pr.n.št.) – sestavljena iz zvezd?
- Klavdij Ptolomej (83-161):”... trak, bel kot mleko...”
- “galaxias”= mlečen: Milky way, Rimska cesta

- Galileo Galilei (1564 – 1642)
I. 1610 s teleskopom videl posamezne zvezde

- Thomas Wright (1711-1786)
in Immanuel Kant (1724-1804)
– sploščen disk, “island universes”

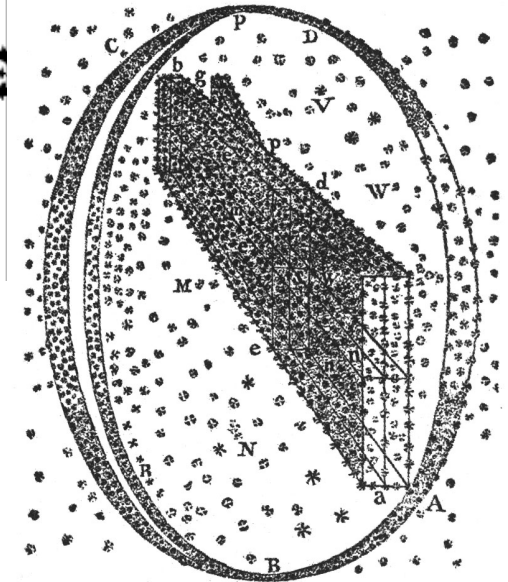
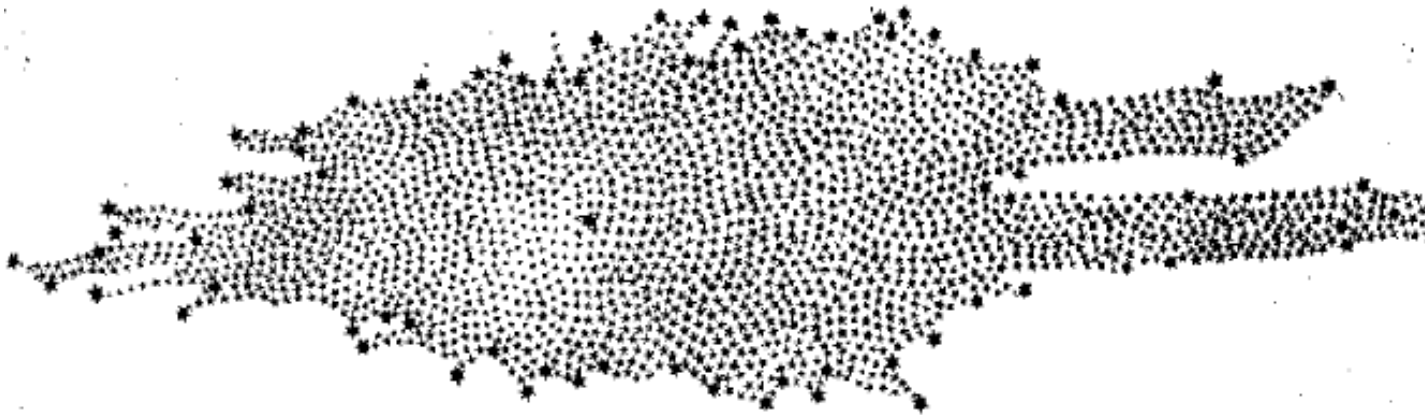


16

POZOR! V slovenščini se izraz Mlečna cesta/pot ne uporablja!

Sir William Herschel (1738-1822)

- štel zvezde v 683 območjih
- ni znal meriti oddaljenosti (1838 Friedrich Bessel prvi izmeri z metodo paralakse)
- 1780(4): elipsoid (1:5), Sonce blizu središča





katalogi zvezd

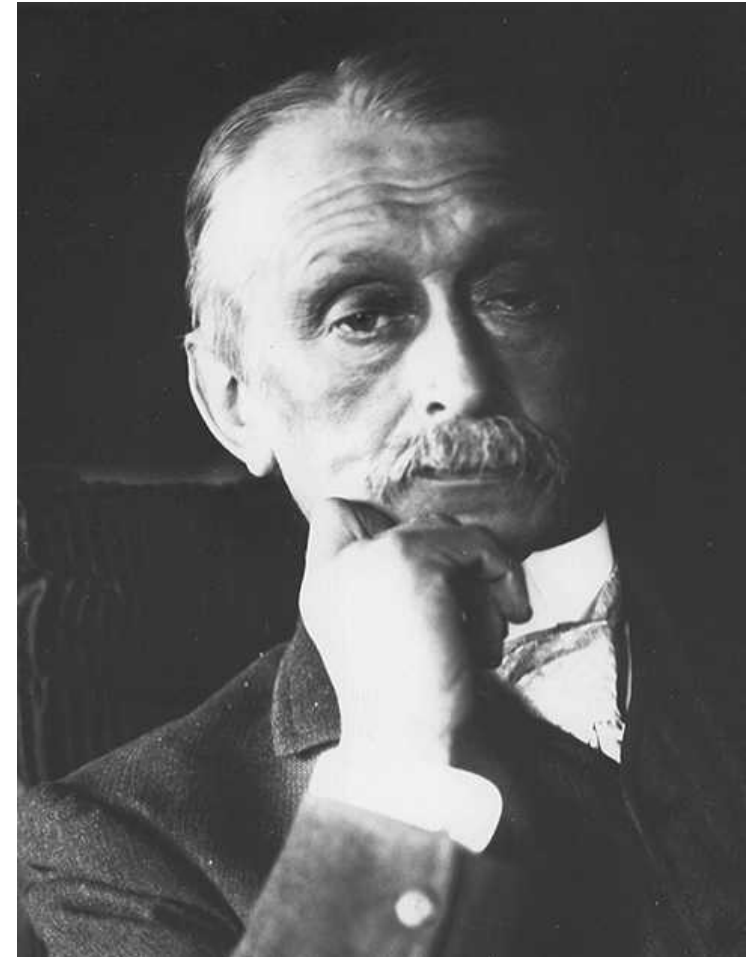
Friedrich Wilhelm Argelander
(1799-1875)

- meril položaje in magnitude zvezd
- 1852-1859: s sodelavci objavil katalog 324.000 zvezd [Bonner Durchmusterung](#)
- statistične študije



Jacobus Kapteyn (1851-1922)

- določiti poskušal velikost in obliko Galaksije
- 1896-1900 - objavil zvezdni katalog Cape Photographic Durchmusterung s položaji in magnitudami 454.875 zvezd na južni polobli.
- I. 1906 začne veliko študijo porazdelitve zvezd v Galaksiji: iz navideznih magnitud, spektralnih tipov, radialnih hitrosti in lastnega gibanja zvezd v 206 conah (prva koordinirana statistična študija v astronomiji, sodelovalo čez 40 observatorijev).



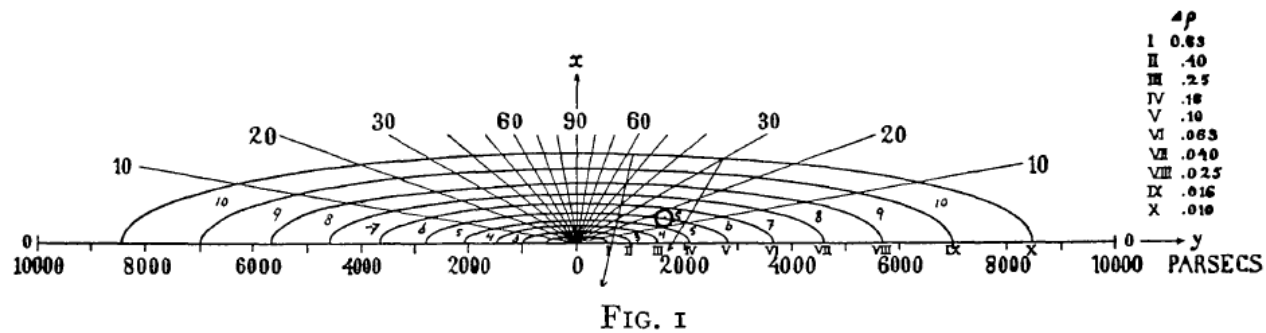


Štetje zvezd

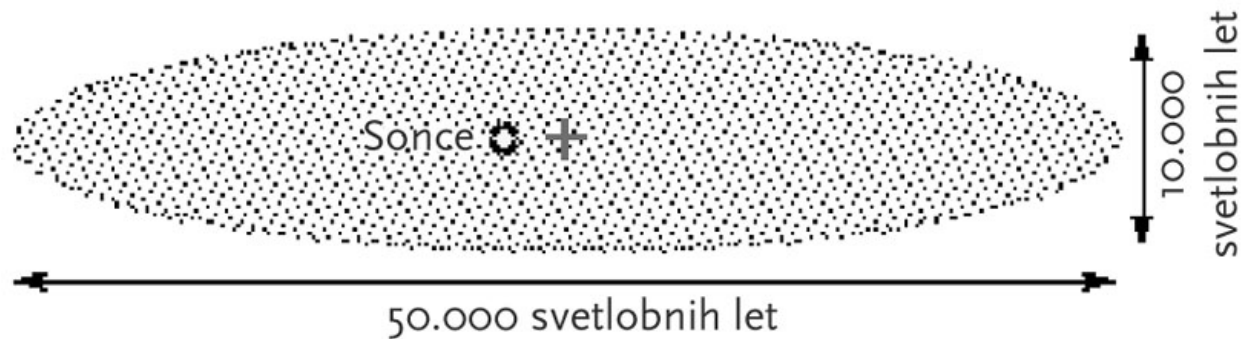




Kapteynovo "vesolje":



Kapteyn 1922



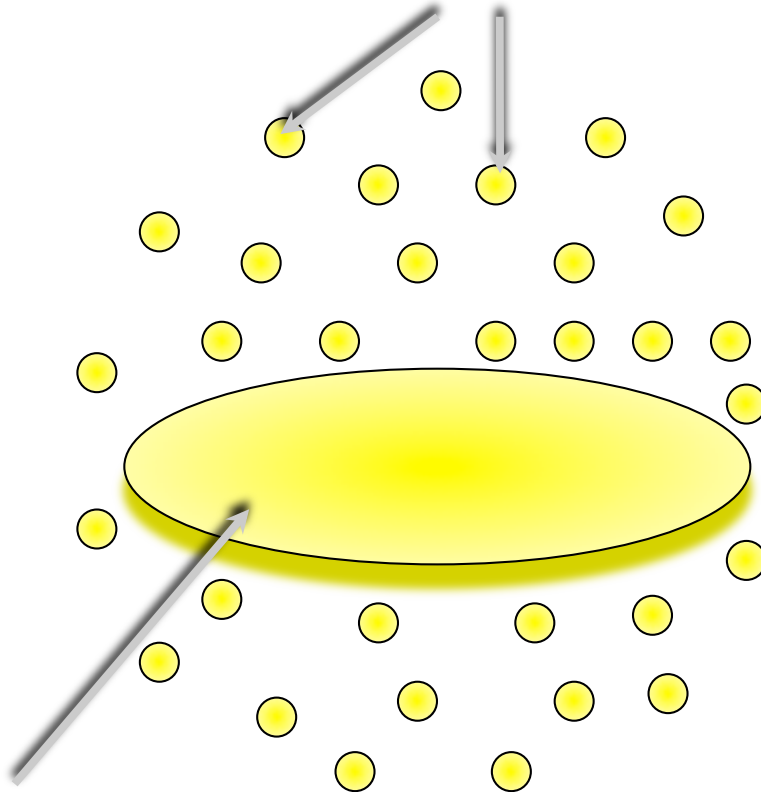
premajhno, ker ni upošteval ekstinkcije svetlobe v medzvezdnem plinu in prahu



Harlow Shapley (1885-1972)

- o uporabil RR Lyrae in W Virginis spremenljivke v kroglastih kopicah za določitev oddaljenosti

kroglaste zvezdne kopice



zvezde v sploščenem sestavu

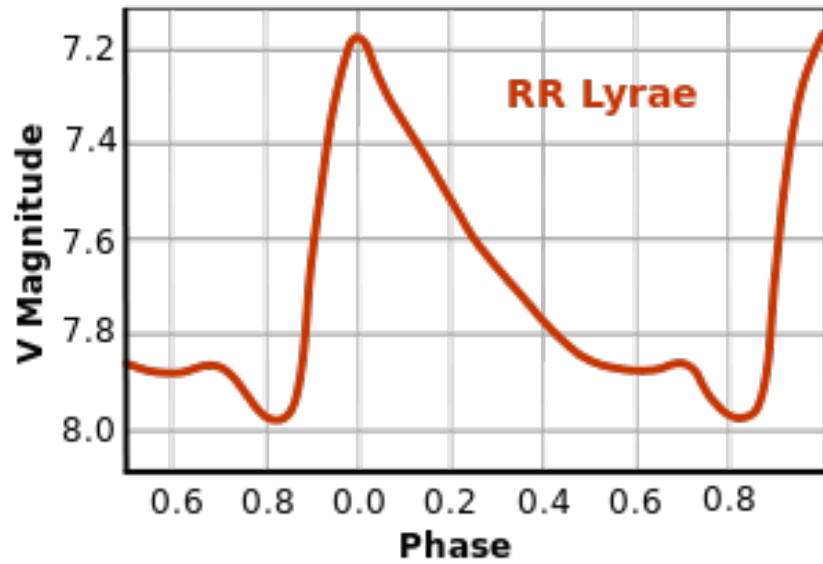


Ugotovitve:

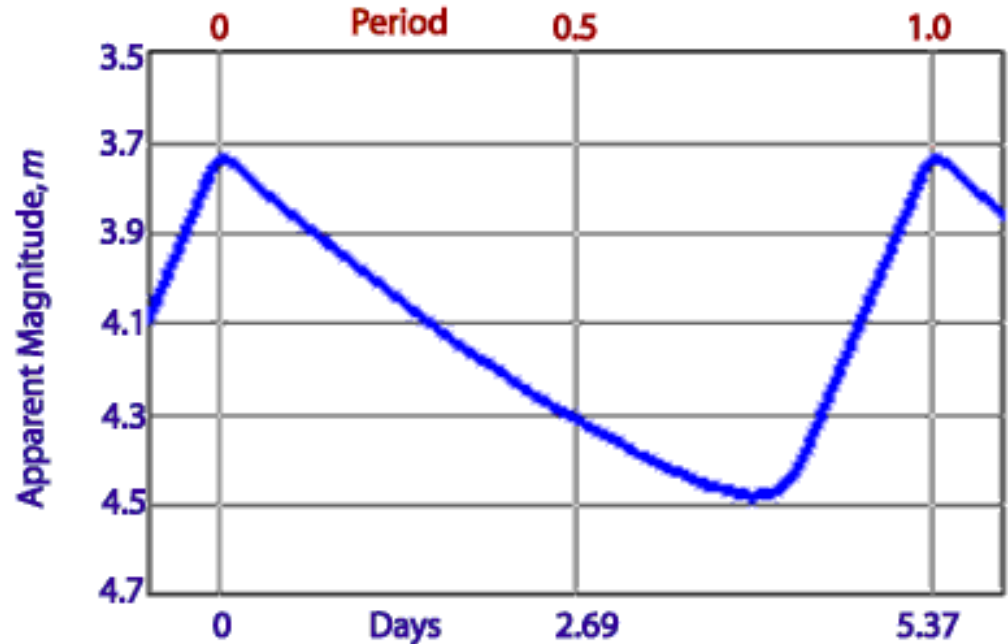
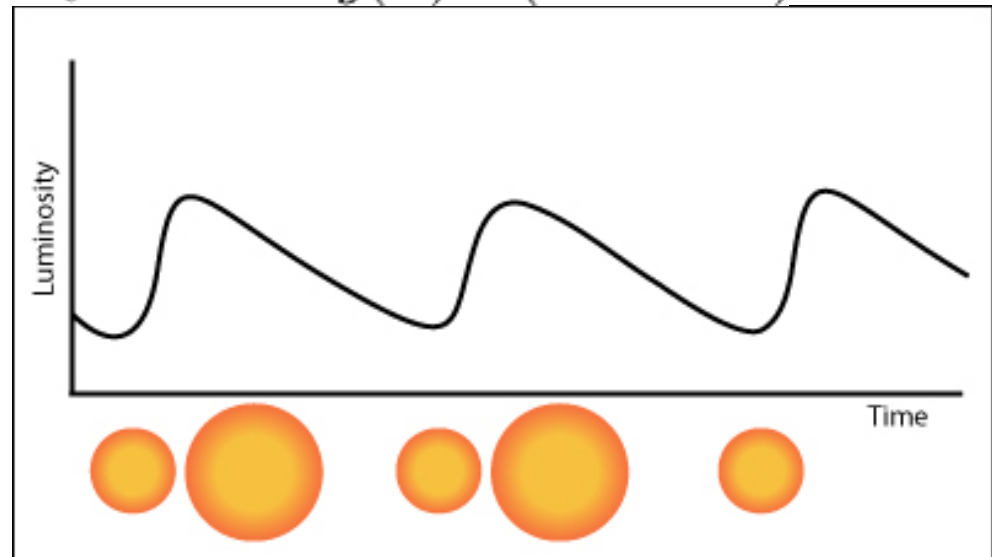
- niso enakomerno razporejene v vse smeri
- kjer so številnejše, so tudi manjše in temnejše
- krogelno razporejene s središčem v smeri Strelca



○ Henrietta Levitt



$$M_v = -2.81 \log(P) - (1.43 \pm 0.1)$$

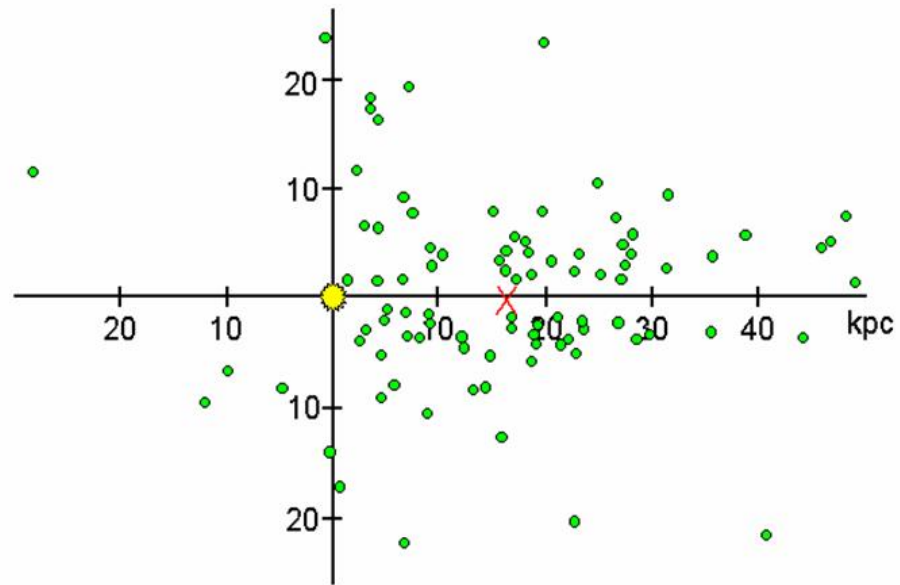


Light Curve for δ Cephei



- prvi sklepal, da **Sonce ni v središču!**
- 1918: Shapleyev model: $\sim 300.000 \times 30.000$ sv. let

Shapley's Globular Cluster Distribution

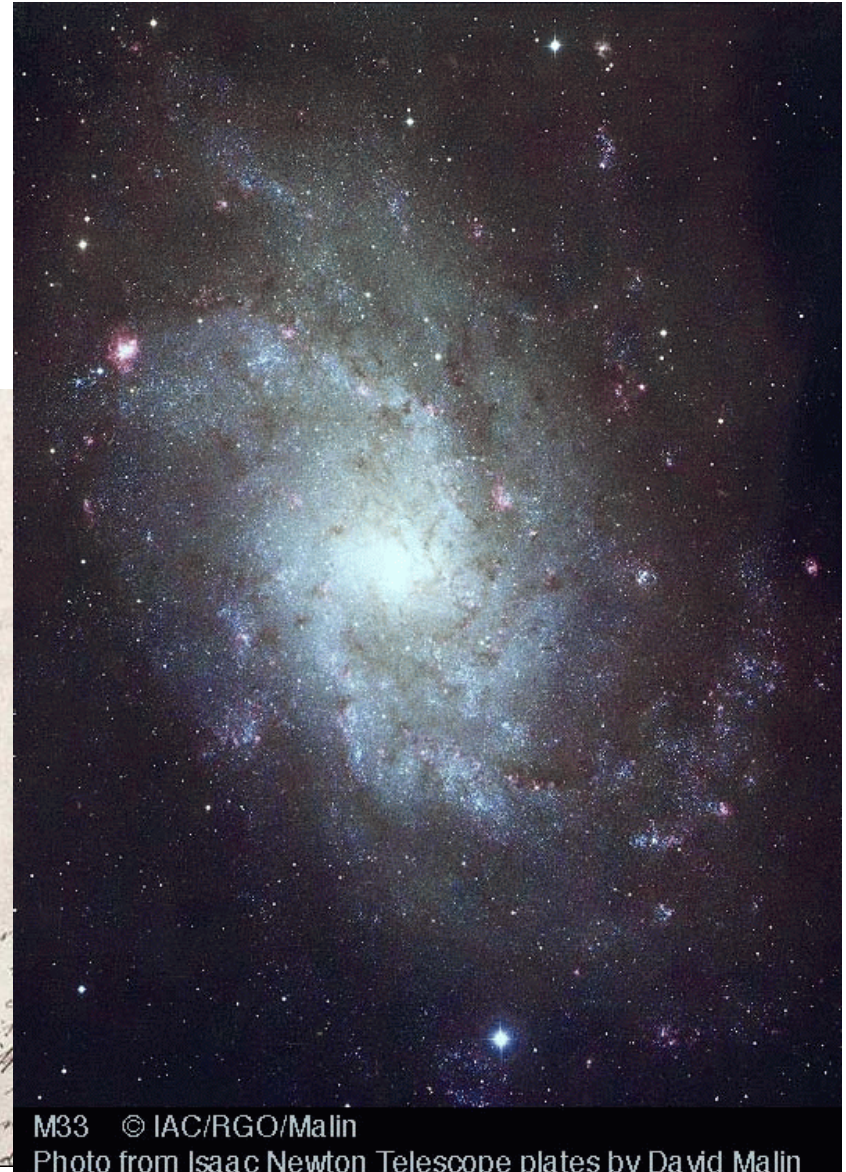
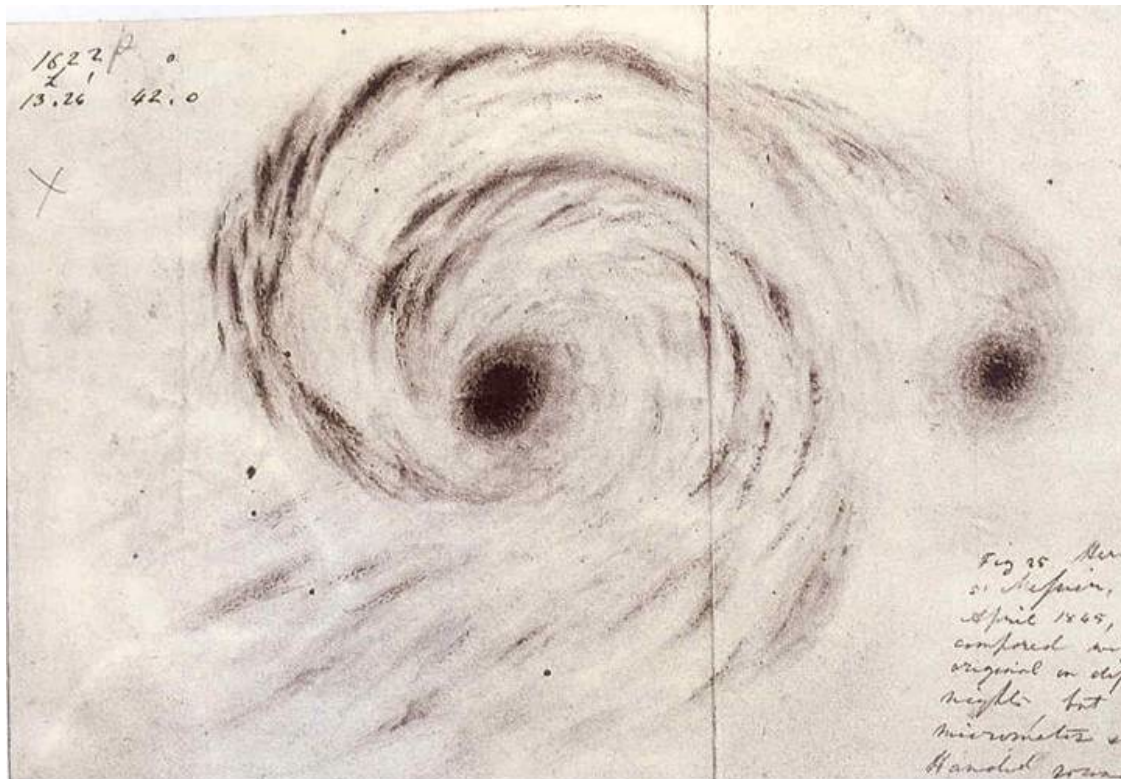


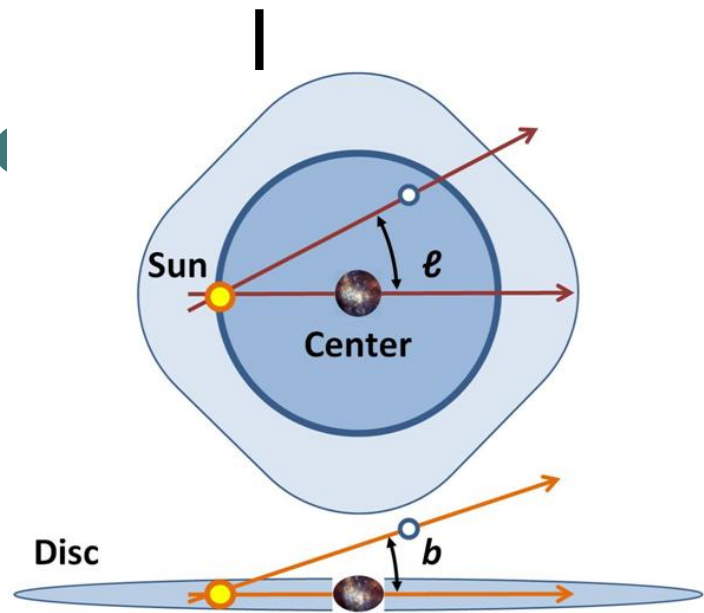
preveliko, ker so bile spremenljivke narobe umerjene,
precenil oddaljenosti

“zone of avoidance” $\pm 10^\circ$

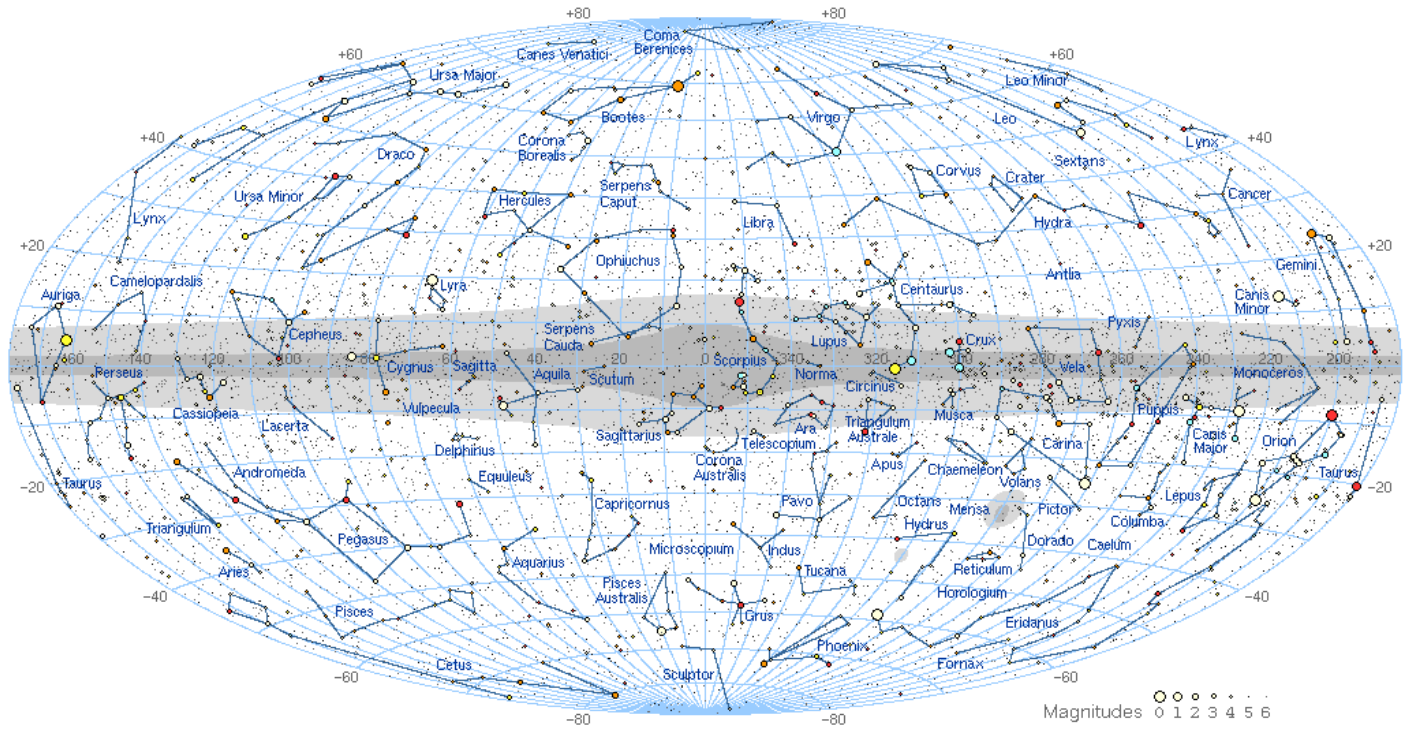


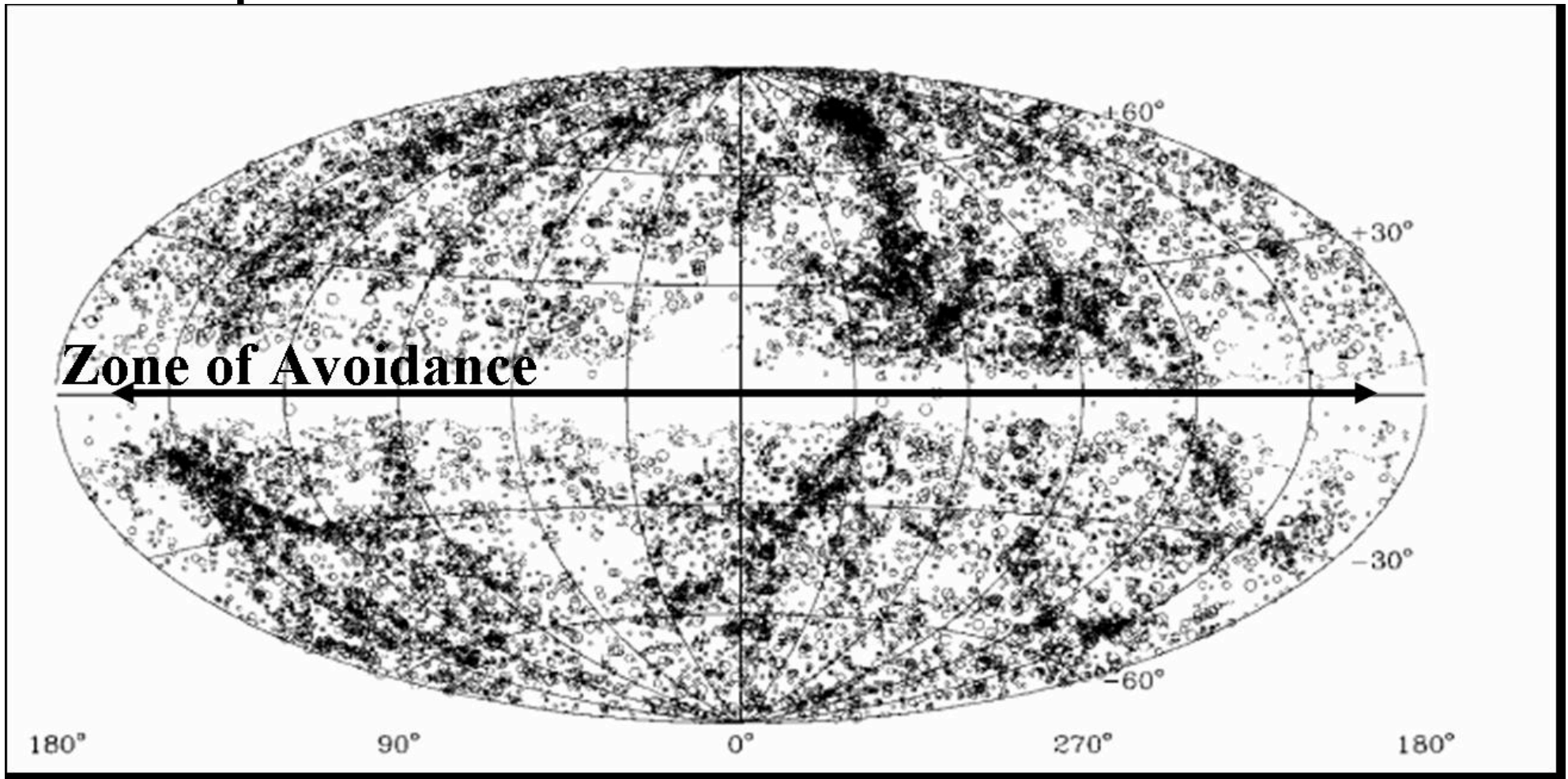
spiralne meglice





rt.gif







Velika debata

- Washington, 1920 - o velikosti Galaksije



Heber Doust Curtis (1872-1942)

“druge galaksije”

- kako daleč so spiralne meglice?
- ali so iz zvezd ali iz plina?
- zakaj se izogibajo ravnini Galaksije?



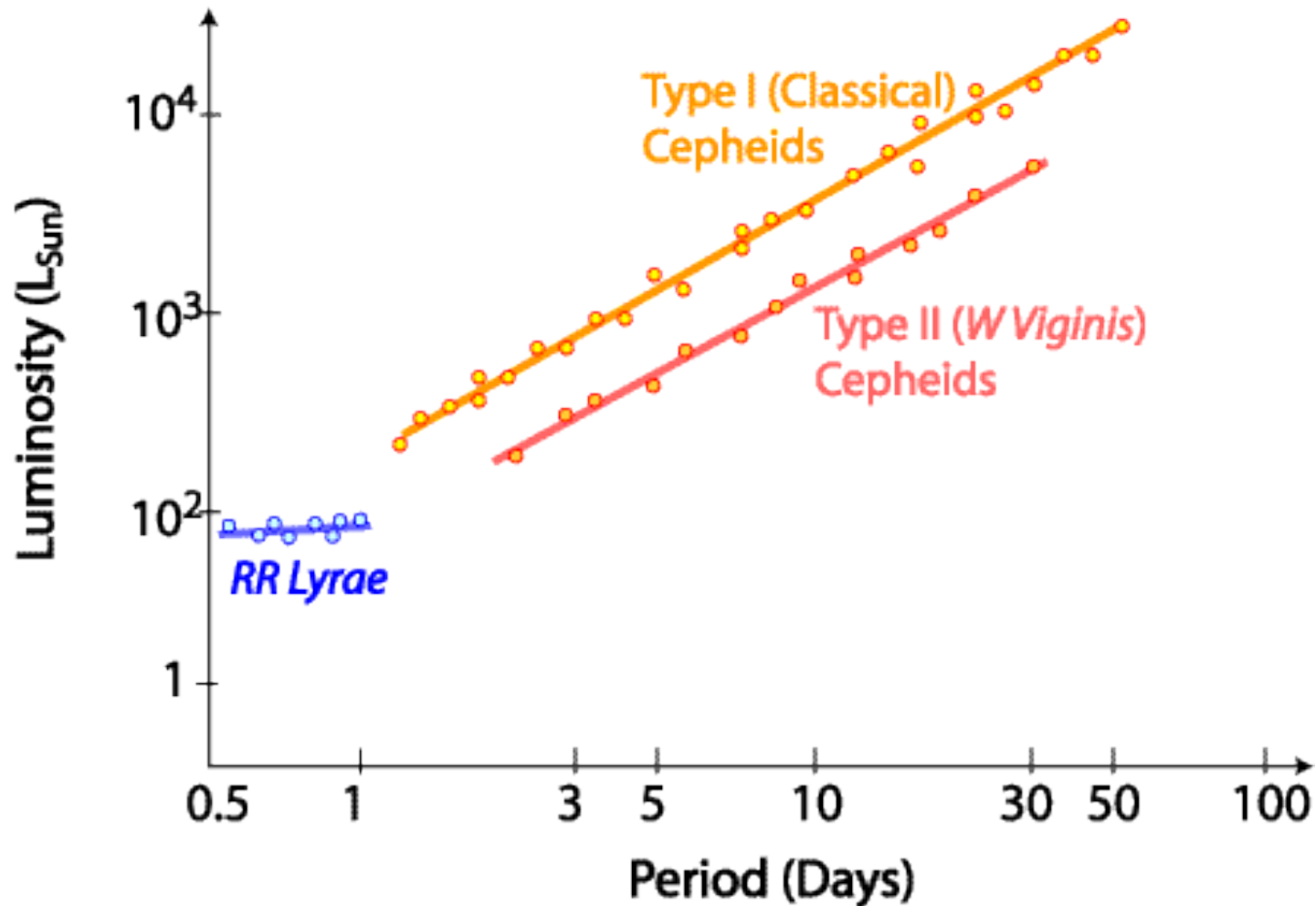
Harlow Shapley

“le bližnji oblaki plina”



kefeide

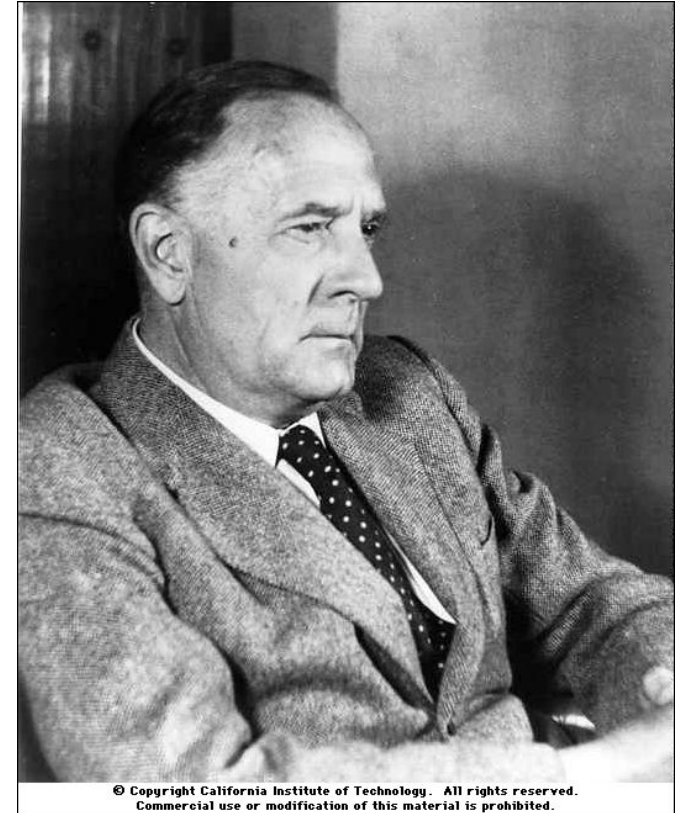
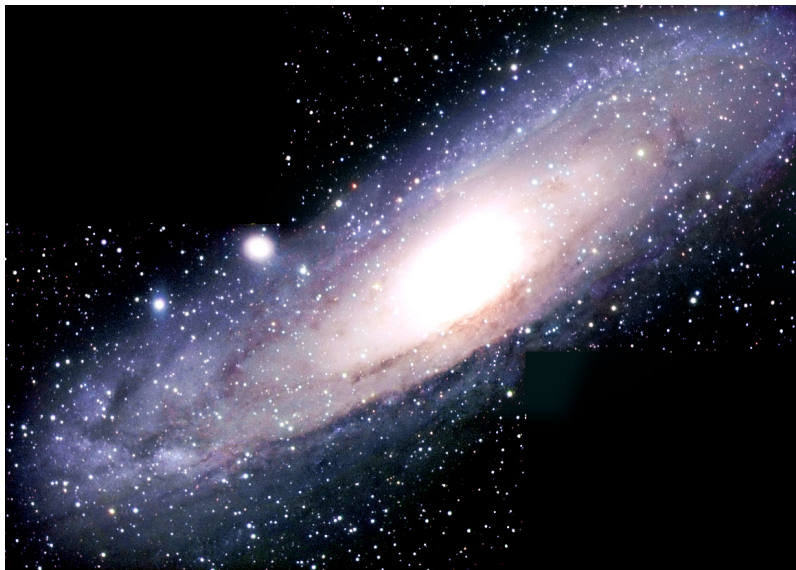
PERIOD - LUMINOSITY RELATIONSHIP





druge galaksije!

- **Edwin Powell Hubble** (1889-1953)
- 1924 – uporabil kefeide v M31 in določil razdaljo



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Andromeda
2 milijona sv. let



medzvezdni plin in prah

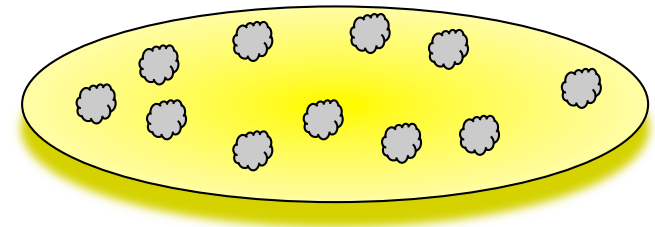


Robert J. Trumpler (1886-1956)

- 1930: opazoval razsute kopice
- prešibke -> medzvezdni plin in prah
- “rdečenje” zvezd

- neodvisno odkril tudi **Boris Aleksandrovich Vorontsov-Velyaminov** (1904-1994)

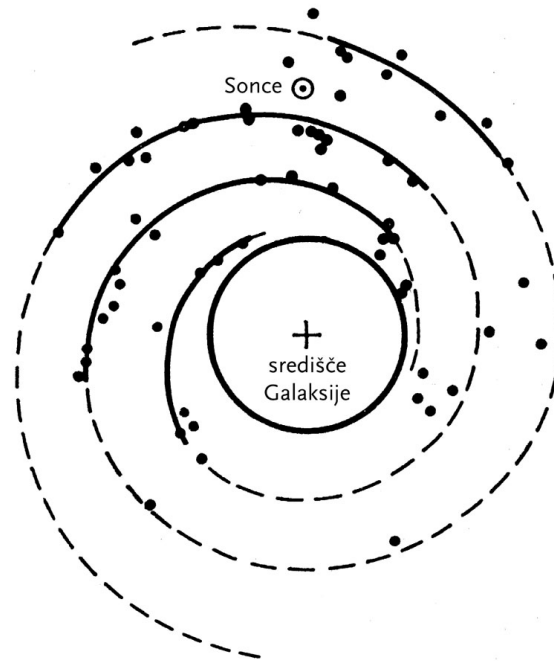
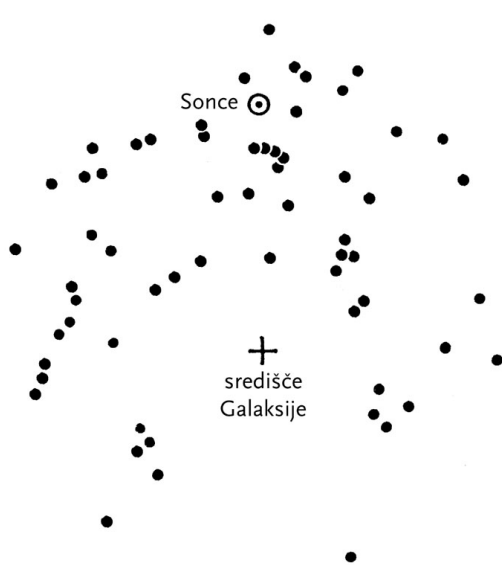
razsute
zvezdne
kopice






Walter Baade (1893-1960)

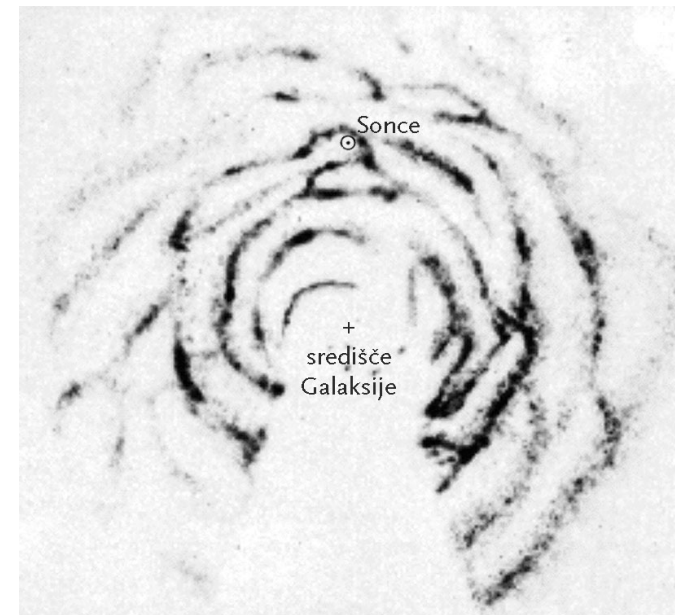
- 2 populaciji zvezd
- spiralni rokavi – svetle orjakinje





Jan Oort (1900-1992)

- 1927: Bertil Lindblad (1895-1965)  rotacija Galaksije (hitrost vrtenja pada z razdaljo)
- Oortov oblak
- galaktični halo
- masa Galaksije ~ 100 milijard M_{Sonca}
- 19.200 sv. let od središča
- radijska astronomija: Hulst – 21-cm vodikova črta, l.1950



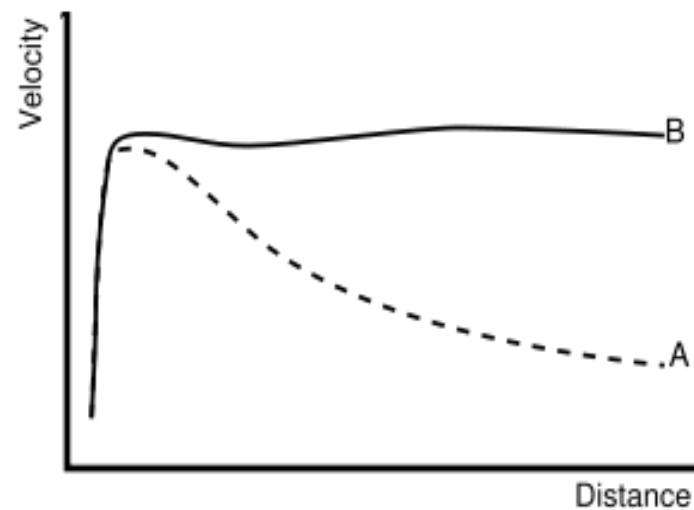


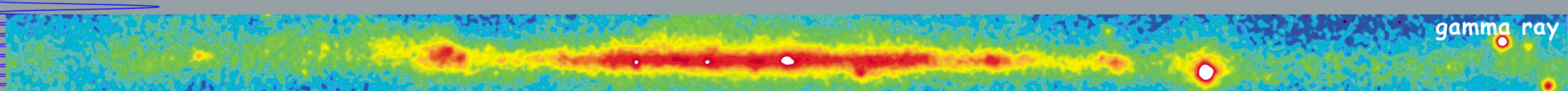
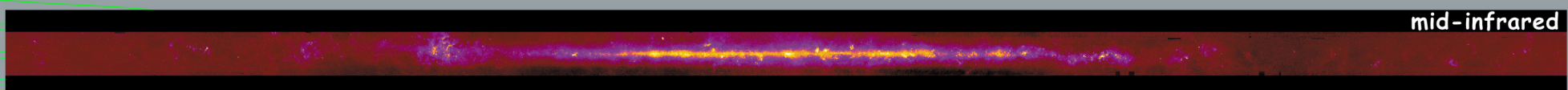
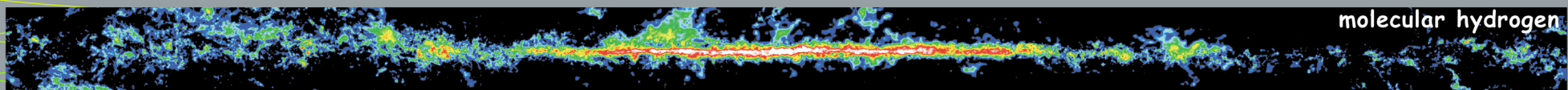
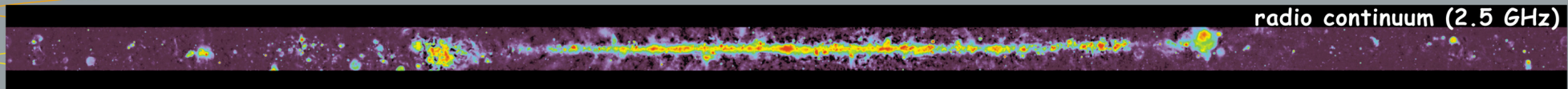
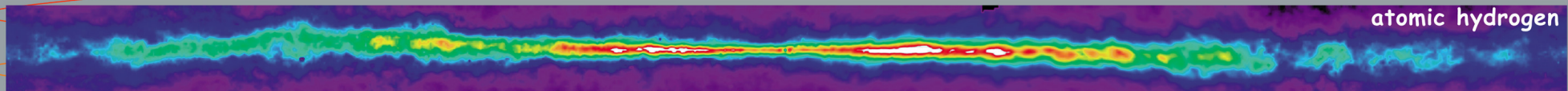
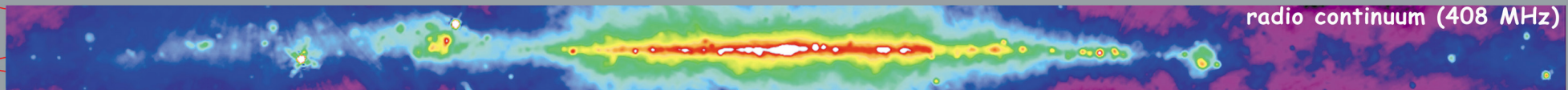
temna snov v galaksijah

Fritz Zwicky (1898-1974)

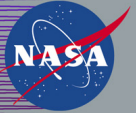
rotacijske krivulje:

Vera Rubin (1928-)





<http://adc.gsfc.nasa.gov/mw>



Multiwavelength Milky Way