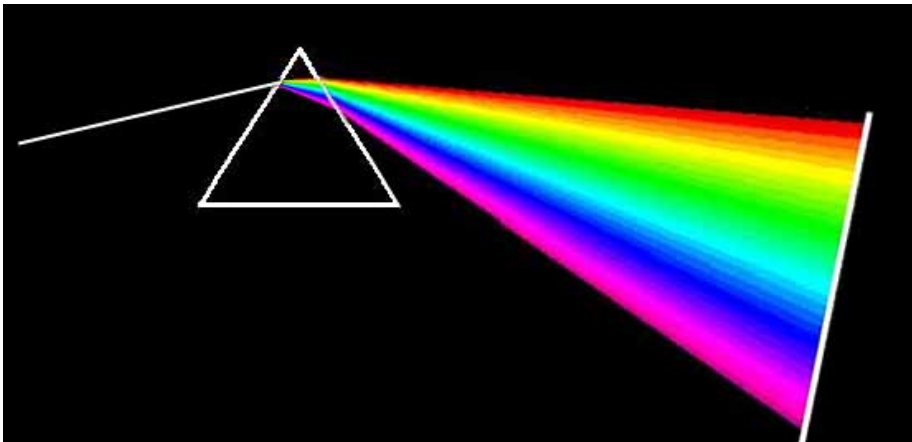
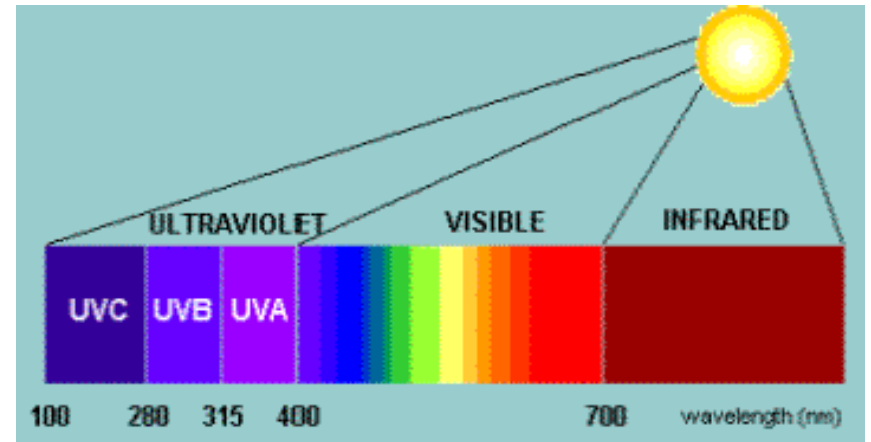


19. ÖLDIN

Litróf ljóssins



Sýnilega rófið
Newton 1672



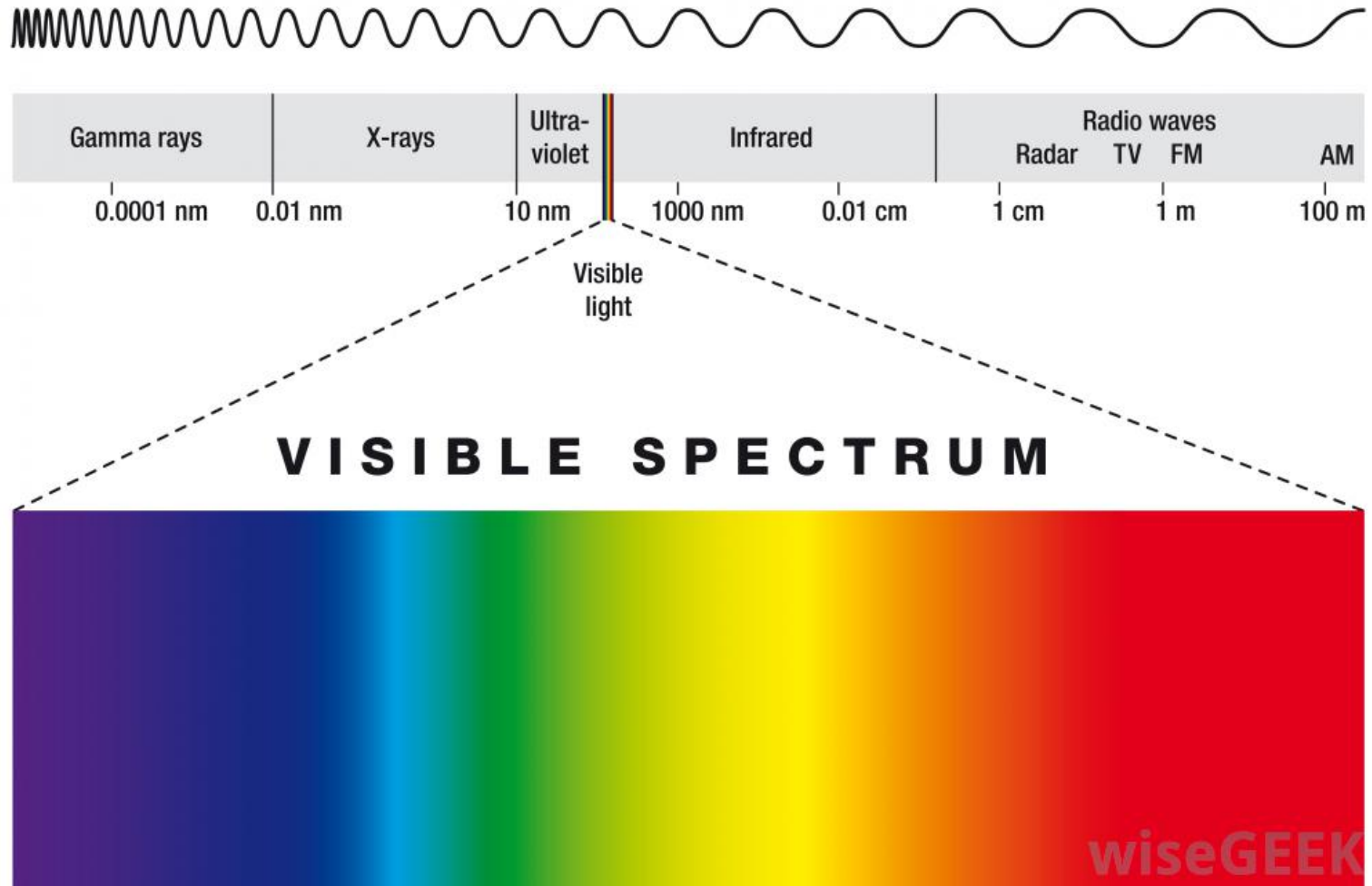
Útfjólublátt ljós
Ritter 1801

Innráutt ljós
Herschel 1800

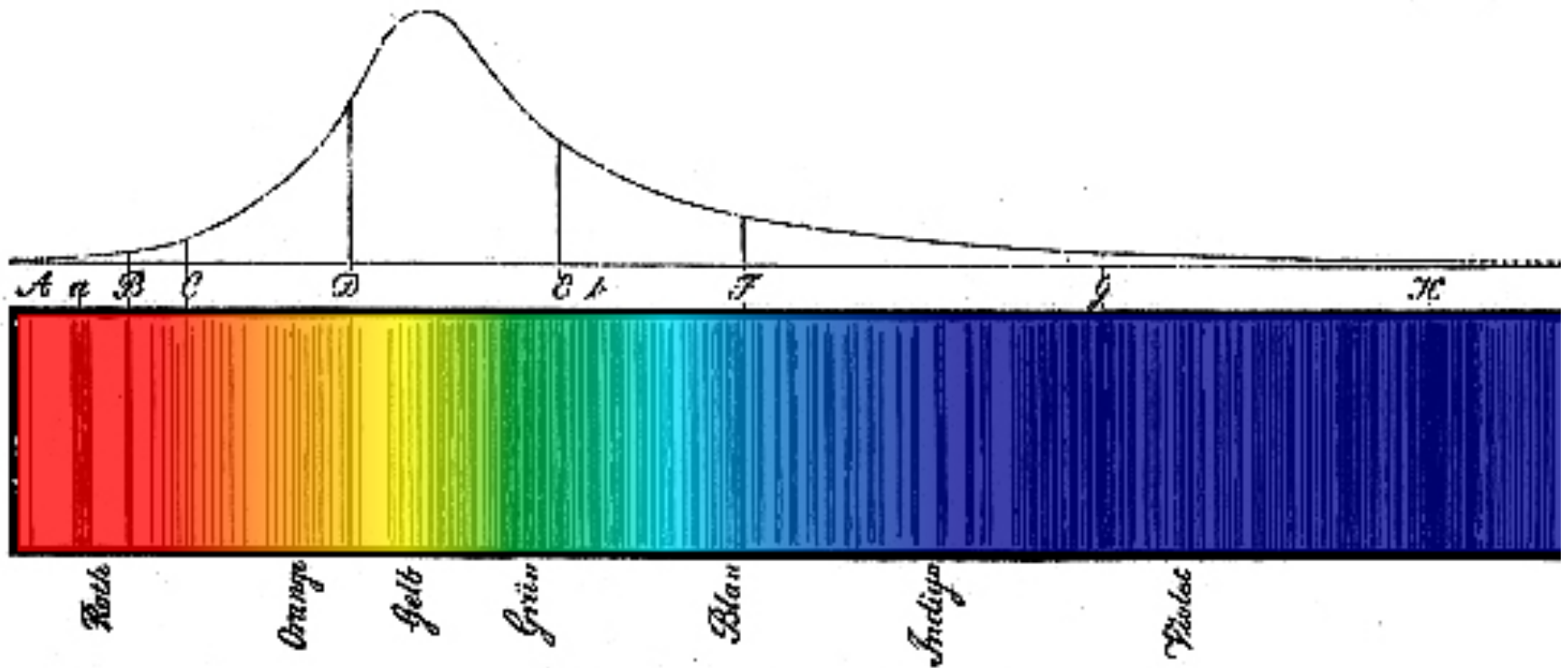
Newton taldi að ljósið væri straumur agna.

Árið 1801 sýndi Thomas Young (1773-1829) fram á að ljósið er bylgjufyrirbæri.

Rafsegulrófið



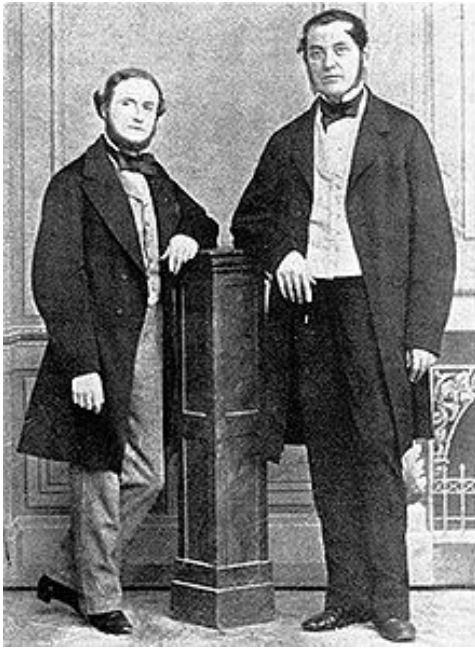
Línur Fraunhofers 1814



Zu Fraunhofer's Abh. Denkschr. 1814-15.

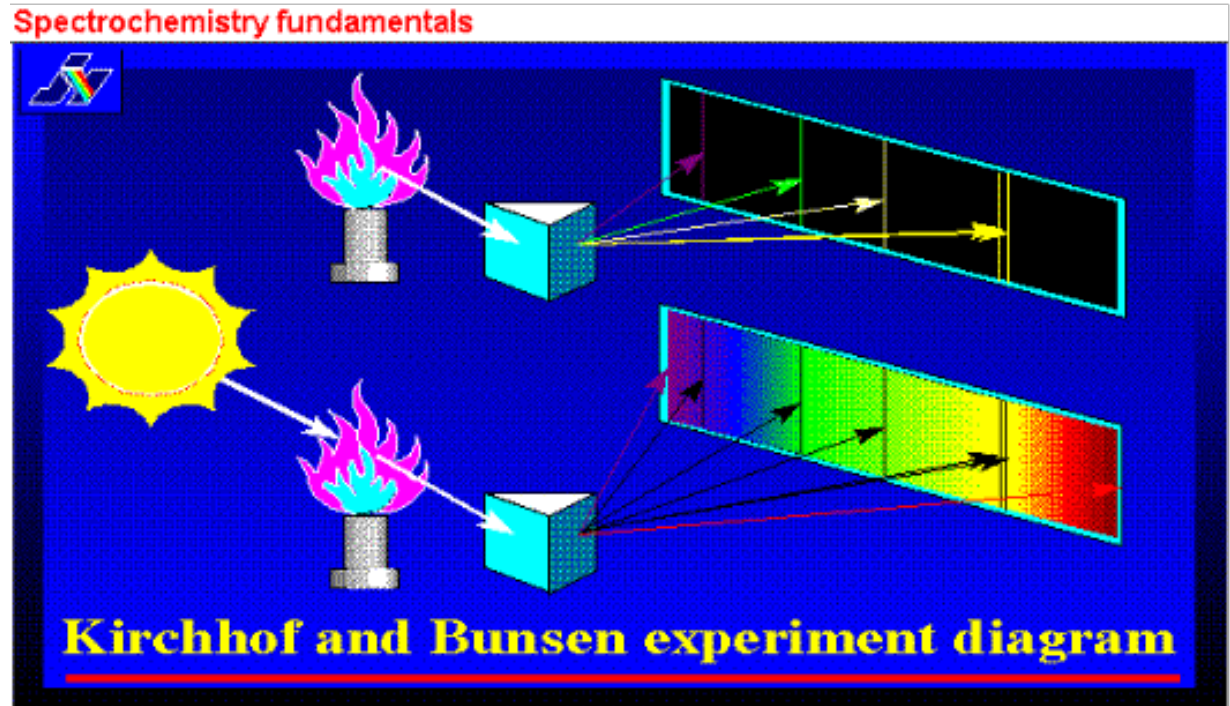
Í litrófi sólar eru svartar línur

Litrófsgreining 1859-60




Kirchoff
(1824-1887)


Bunsen
(1811-1899)




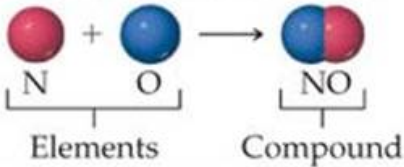
Atómkenning Daltons 1808

Dalton's Atomic Theory

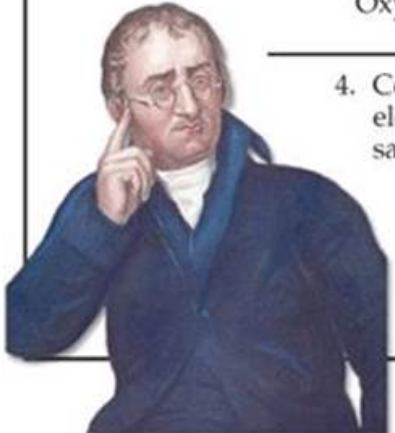
1. Each element is composed of extremely small particles called atoms.


An atom of the element oxygen An atom of the element nitrogen
2. All atoms of a given element are identical, but the atoms of one element are different from the atoms of all other elements.


Oxygen Nitrogen
3. Atoms of one element cannot be changed into atoms of a different element by chemical reactions; atoms are neither created nor destroyed in chemical reactions.


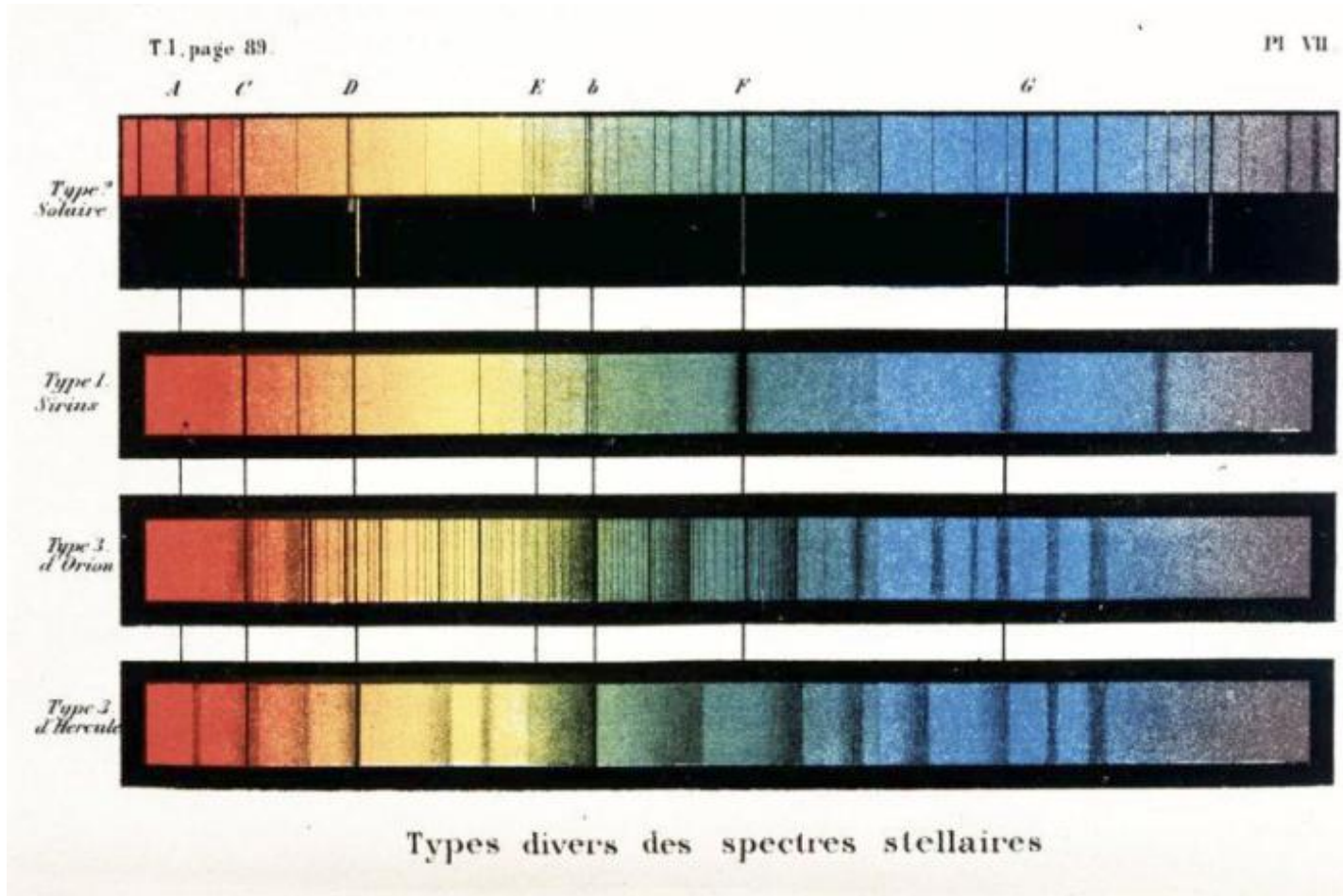
Oxygen Nitrogen
4. Compounds are formed when atoms of more than one element combine; a given compound always has the same relative number and kind of atoms.


Elements Compound



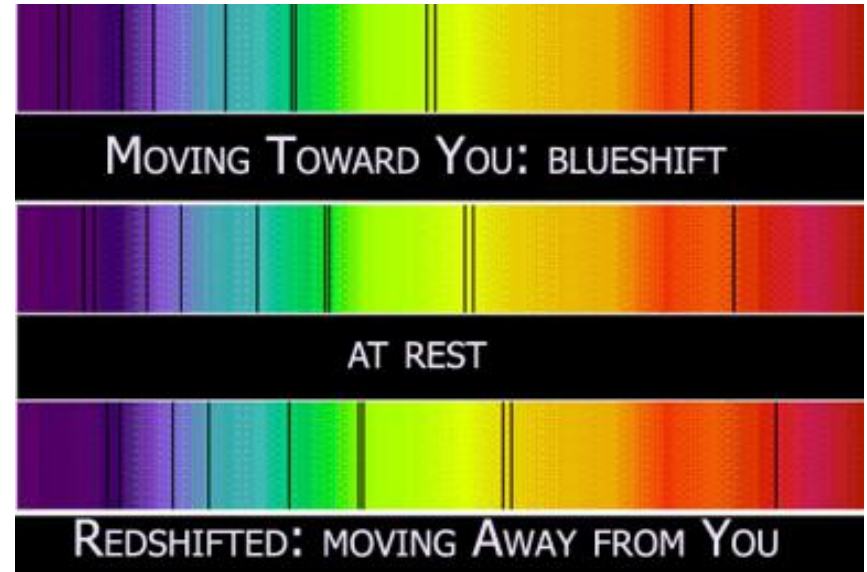
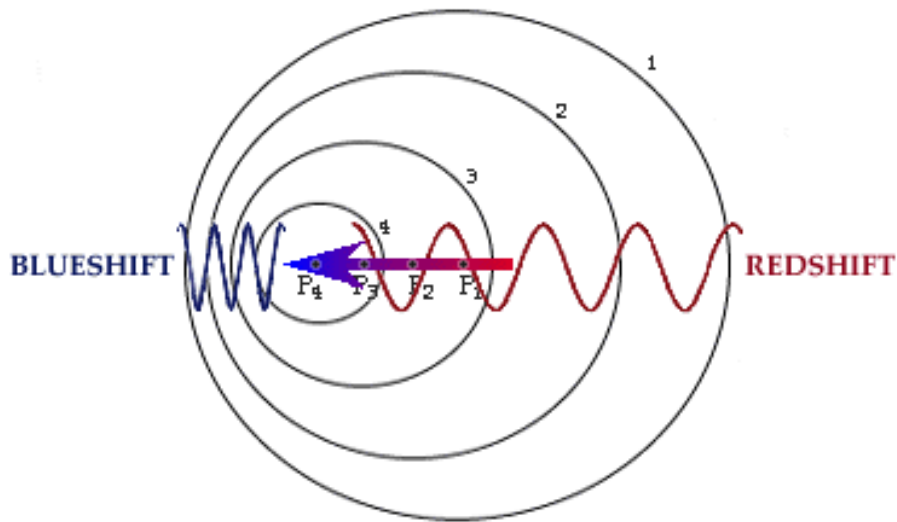
John Dalton (1766-1844)

Stjörnulitróf



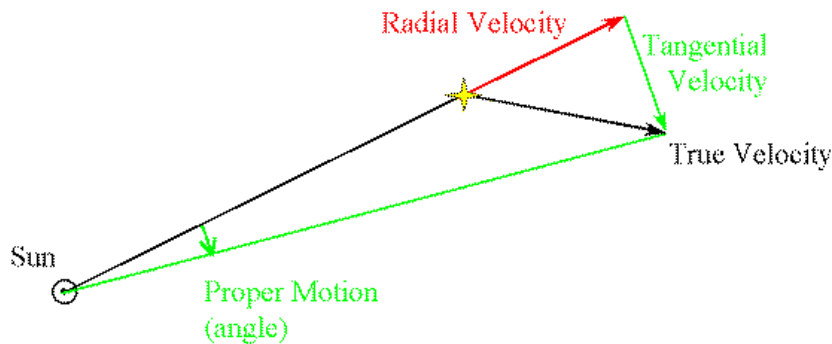
Ýmis stjörnuróf frá 1860-70 (Angelo Secchi).

Dopplerfærsla 1842



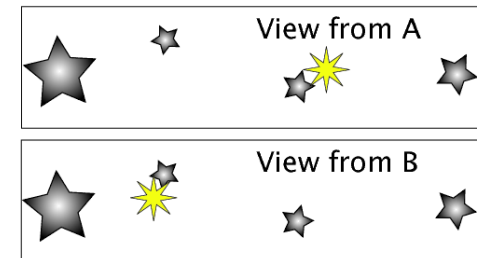
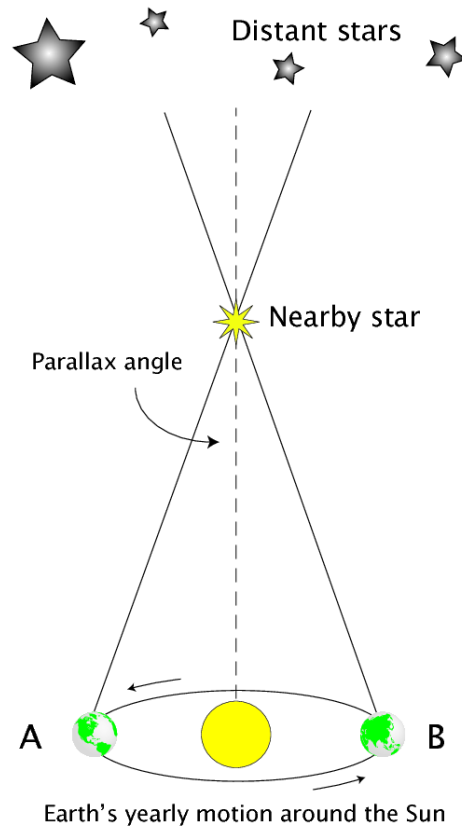
Christian Doppler (1803-1853)

Fjarlægð og hreyfing stjarna



Eiginhreyfing (tangential velocity)
Fyrst mæld 1718 (Halley)

Burthraði (radial velocity)
Fyrst mældur uppúr 1880 (Dopplervik)



Friedrich Bessel (1784-1846) mældi fyrstur manna árlega hliðrun stjörnu (61 Cygni) árið 1838

Ljósmyndir og stjörnufræði



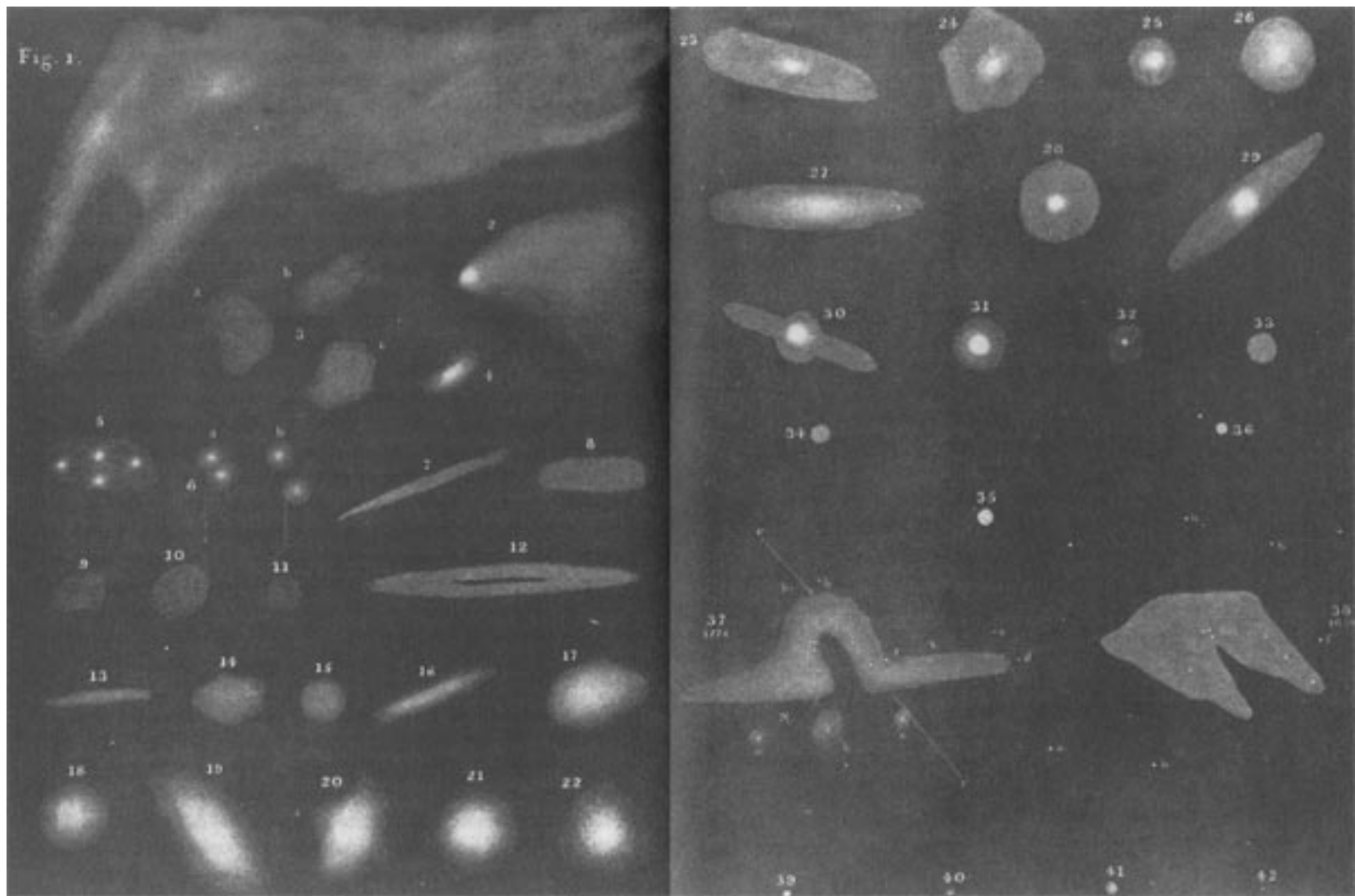
Mynd Johns A. Whipple
af tunglinu frá 1852



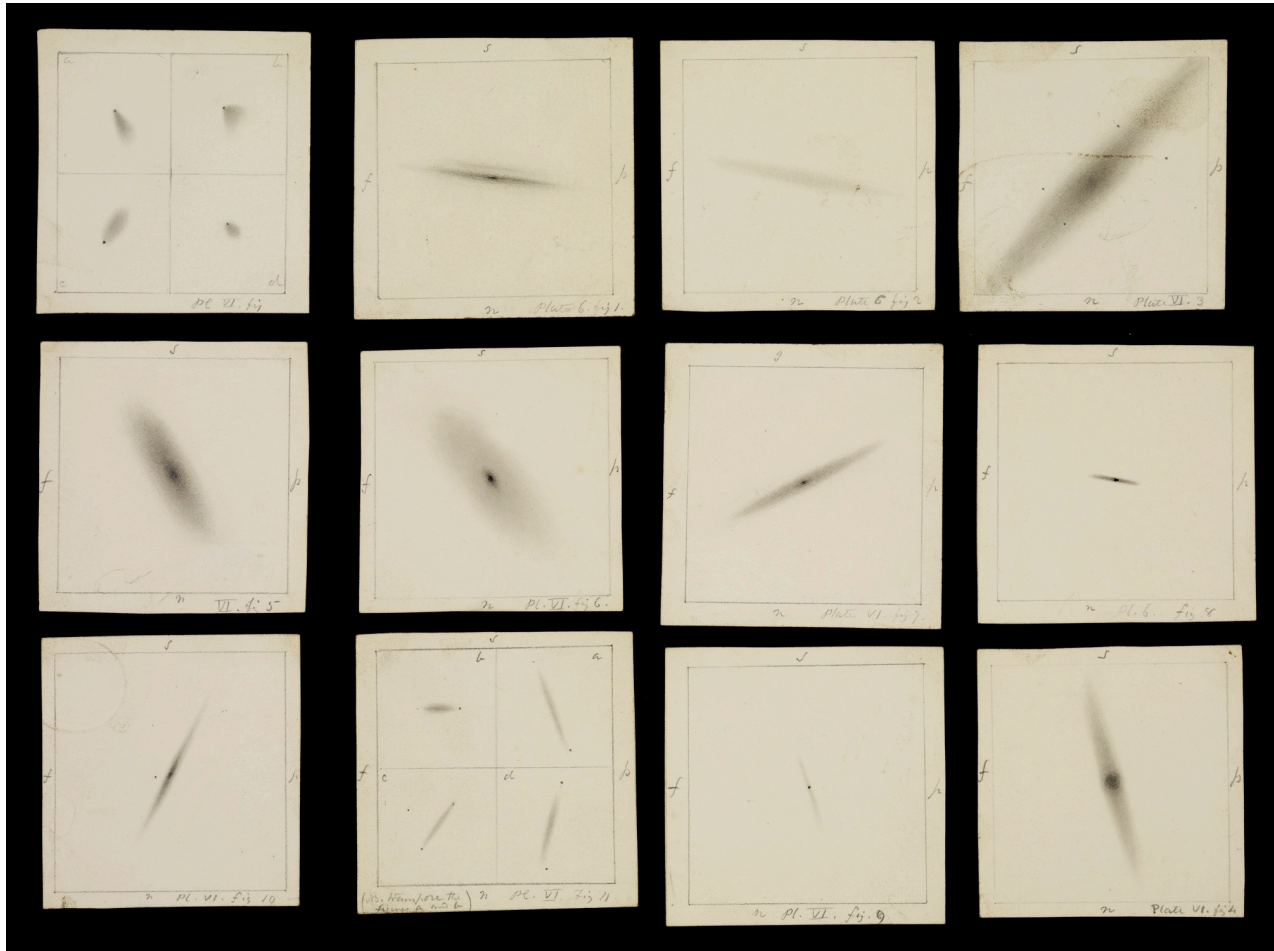
Fyrsta myndin af sverðpokunni miklu
í Óríon (Henry Draper 1880)

Þokustjörnur eða stjörnupokur?

Tekningar W. Herschels af þokustjörnum 1811

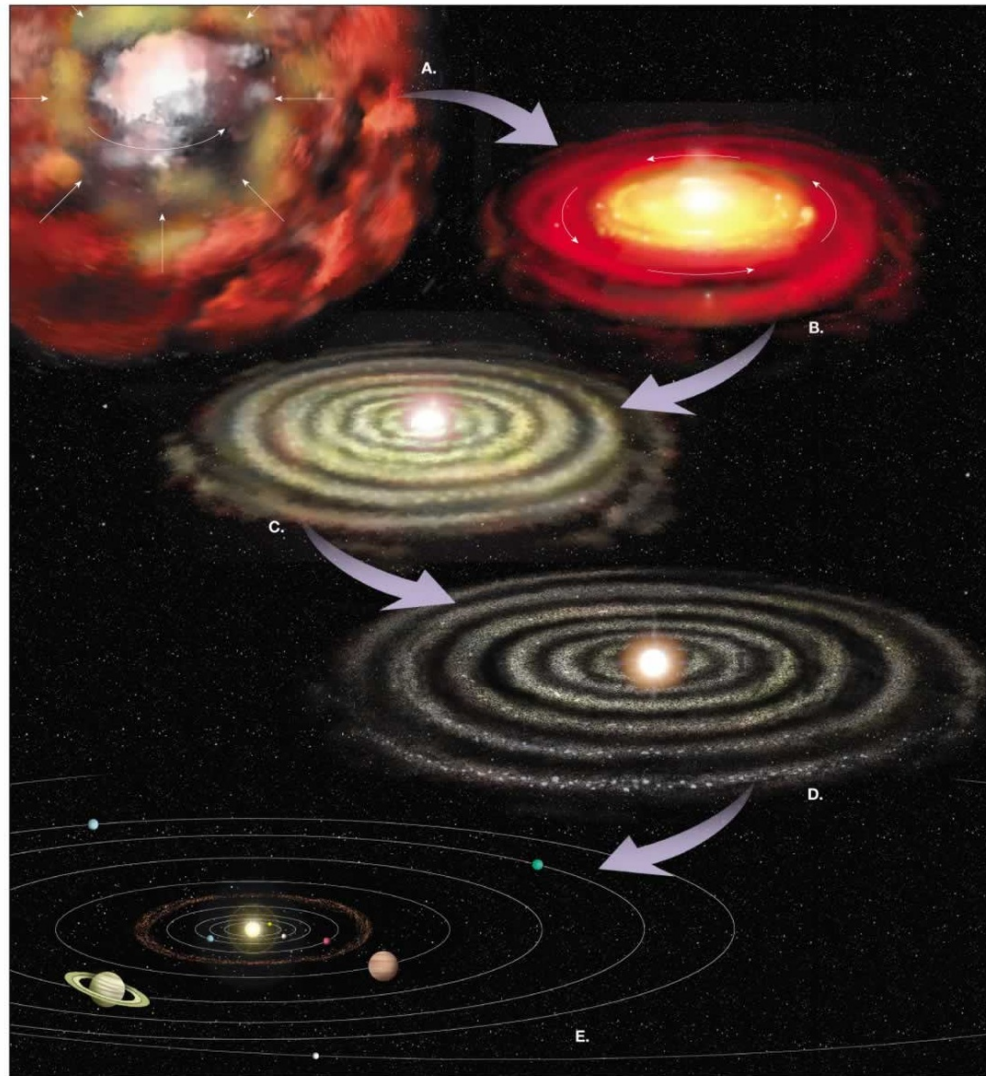


John Herschel (1792-1871) og þokustjörnur



Teikningar frá árunum 1825 til 1833

Þokukenning Kants (1755) og Laplaces (1796)



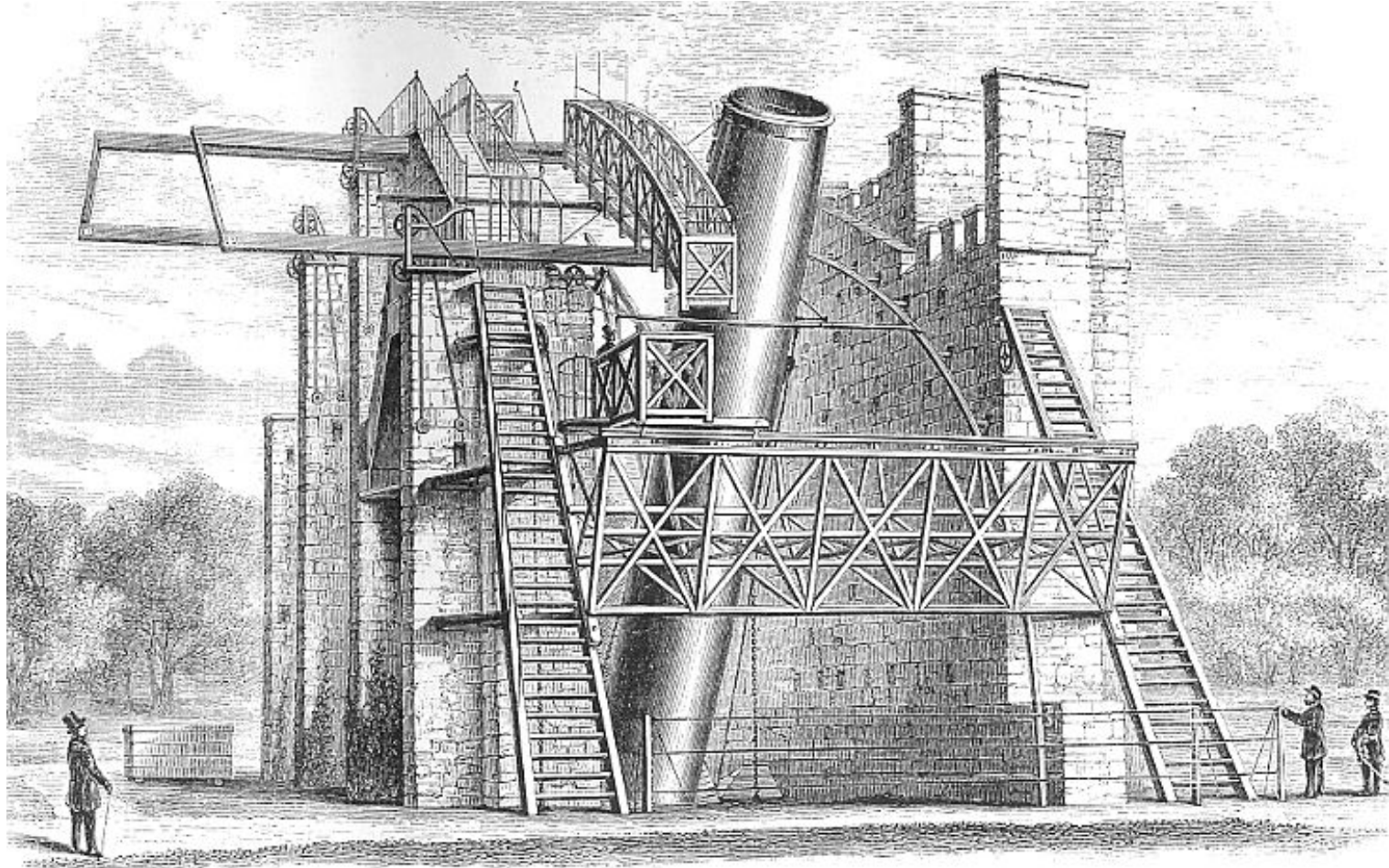
Myndun sólkerfisins
úr gríðarstórru gasskýi

Úr bréfi Manna (Ármanns Sveinssonar) til móður sinnar, Sigríðar, skrifað í Louvain 30. mars 1885



Manni lýsir myndun sólkerfisins samkvæmt þokukeningunni fyrir móður sinni

Risasjónauki Williams Parsons frá 1845



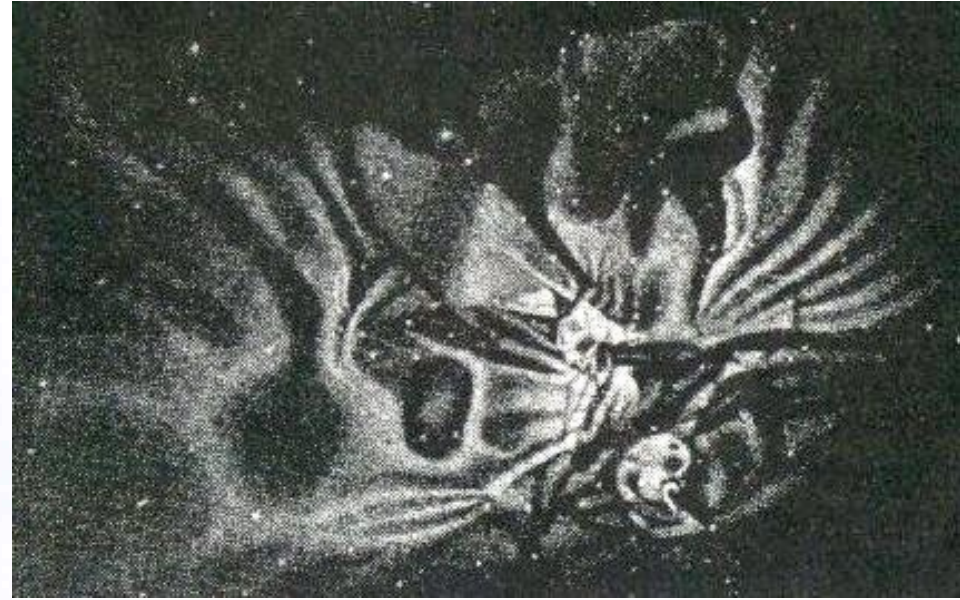
Þvermál spegils = 1,8 m – Brennivídd = 16 m

William Parsons (1800-1867) var þriðji jarlinn af Rosse

Það sem Parsons sá og teiknaði

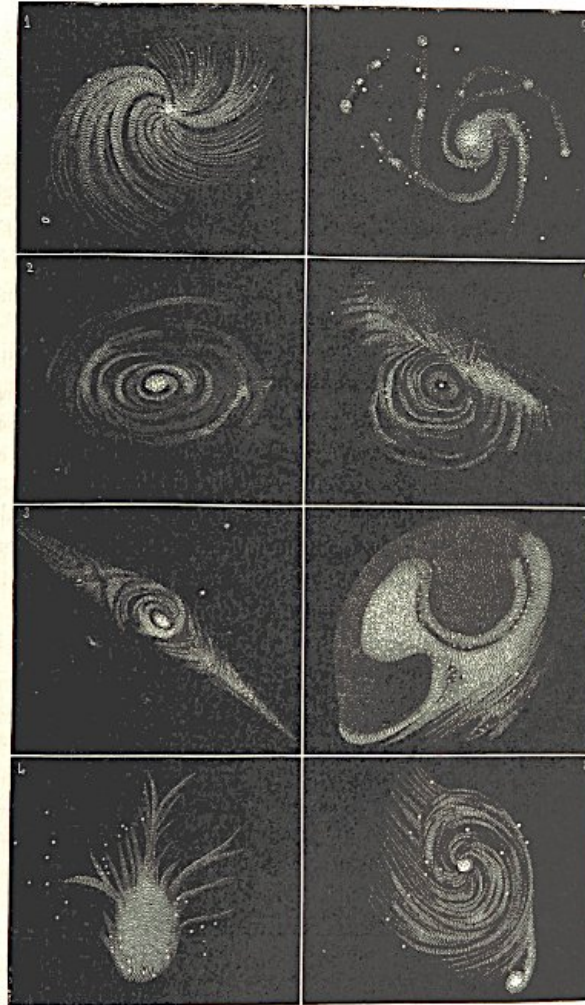


Þyrilþokan M51
1845



Sverðþokan í Óríon
1846

Fleiri teikningar Parsons af þokum

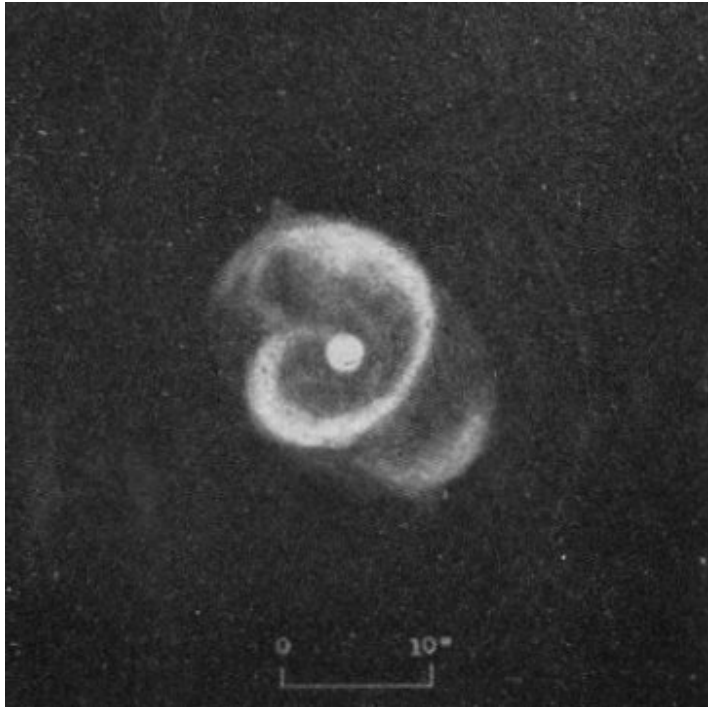


Myndir birtar 1886

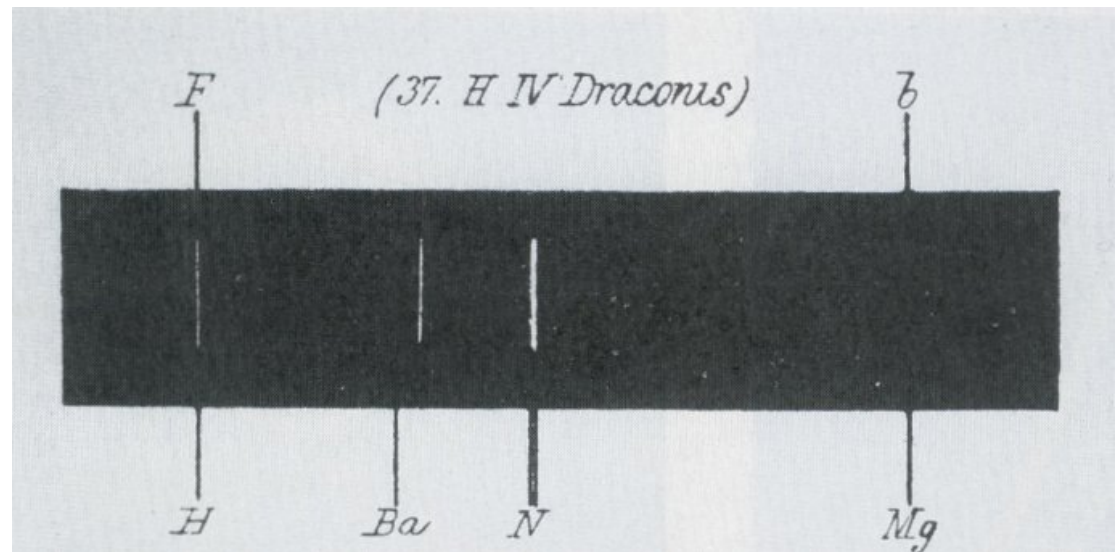
Nébuleuses d'après Lord Rosse.

1. N. de la Vierge. — 2. N. du Lion. — 3. Autre N. du Lion. — 4. N. de Taureau. — 5. N. de Géphée.
6. N. de Pégase. — 7. N. du Renard (Bamb-Pell d'Herschell). — 8. N. des Chiens de Chasse.

William Huggins (1824-1910) og NGC 6543

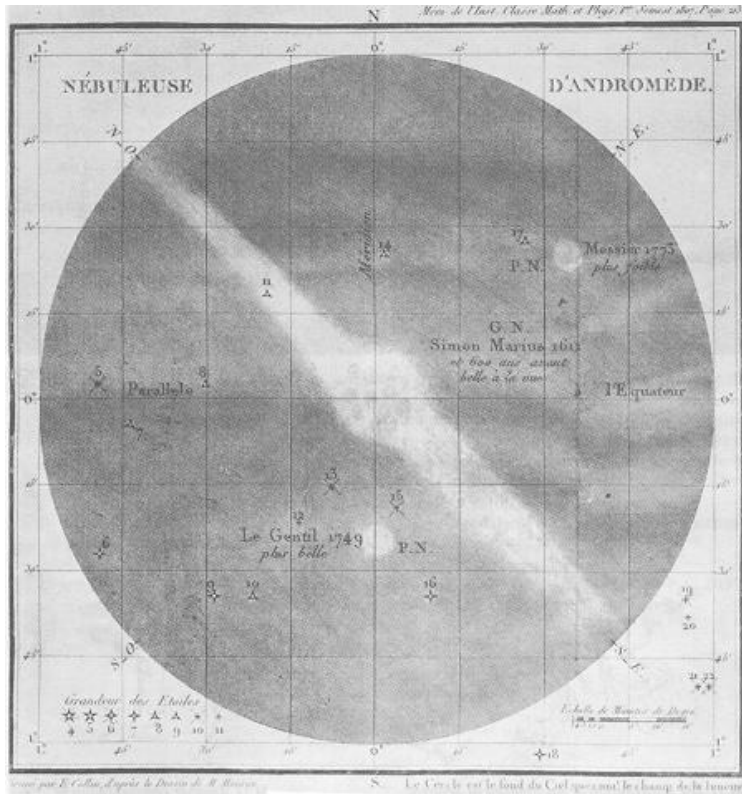


Mynd af hringpokunni
NGC 6543 í Drekkamerki



Litrófið er línuróf sem bendir til þess
að ljósið komi frá gasi, ekki stjörnum

Andrómeduþokan M31



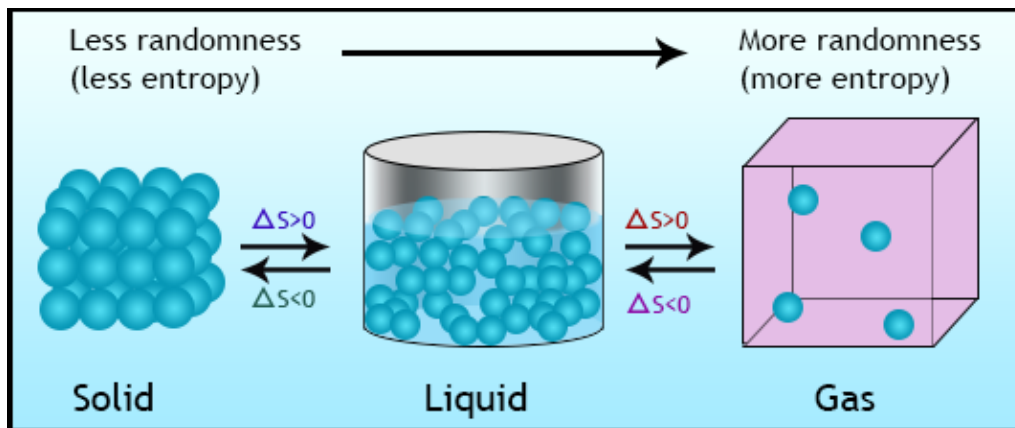
Teikning Messiers frá 1807



Fyrsta ljósmyndin (Isaac Roberts 1888).

Róf sem Júlíus Scheiner tók 1899 líktist að hans mati mjög litrófi sólarinnar

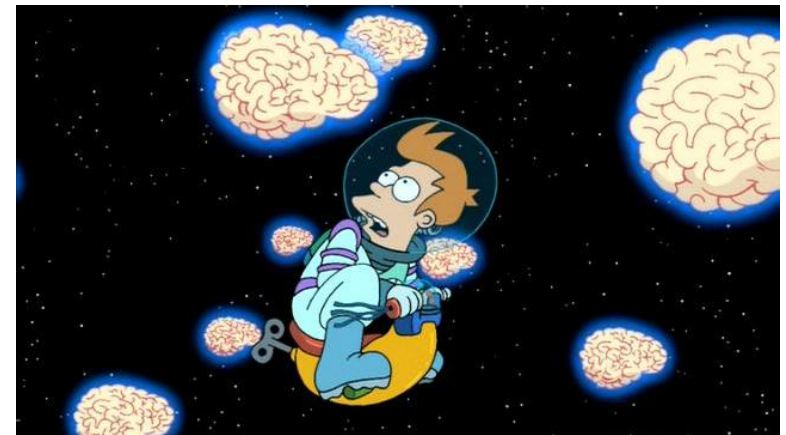
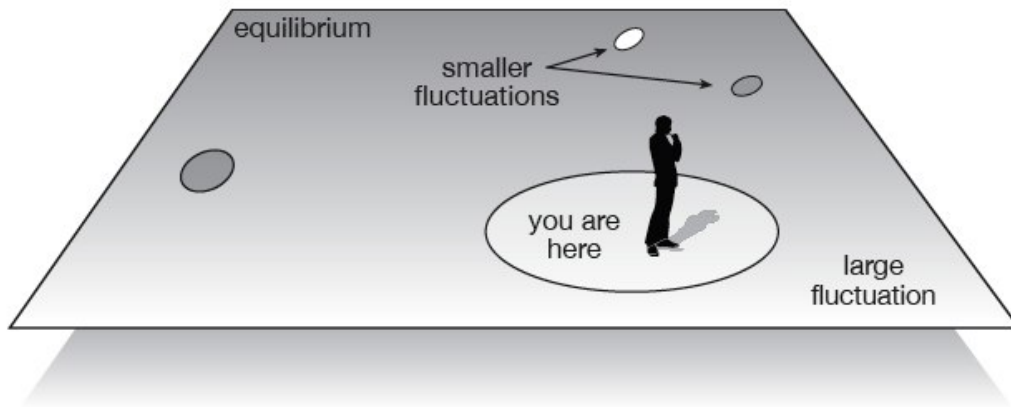
Óreiða, annað lögmál varmafræðinnar og varmadauðinn



Heat Death of the Universe

- The entropy of the Universe always increases
- The entropy of the Universe should ultimately reach a maximum
 - At this time, the Universe will be at a state of uniform temperature and density
 - This state of perfect disorder implies no energy will be available for doing work
- This state is called the *heat death* of the Universe

Safneðlisfræði Boltzmanns beitt í heimsfræði



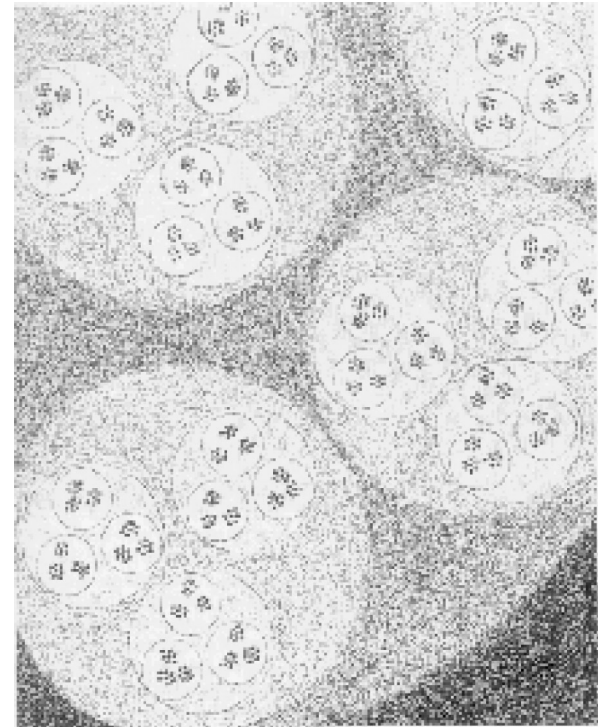
Óreiðuflökt í alheimi í varmajafnvægi
(þ.e. óreiðan er í hámarki)

Boltzmann heilar

Þversagnir þyngdarinnar



Ef þyngdarlögmáli Newtons er beitt á óendanlega jafna stjörnuþreifingu leiðir það til þversagna (Seeliger 1895)



Óendanlegur stigveldisheimur Charliers (frá 1908) leysir vandann, en er ekki í samræmi við athuganir