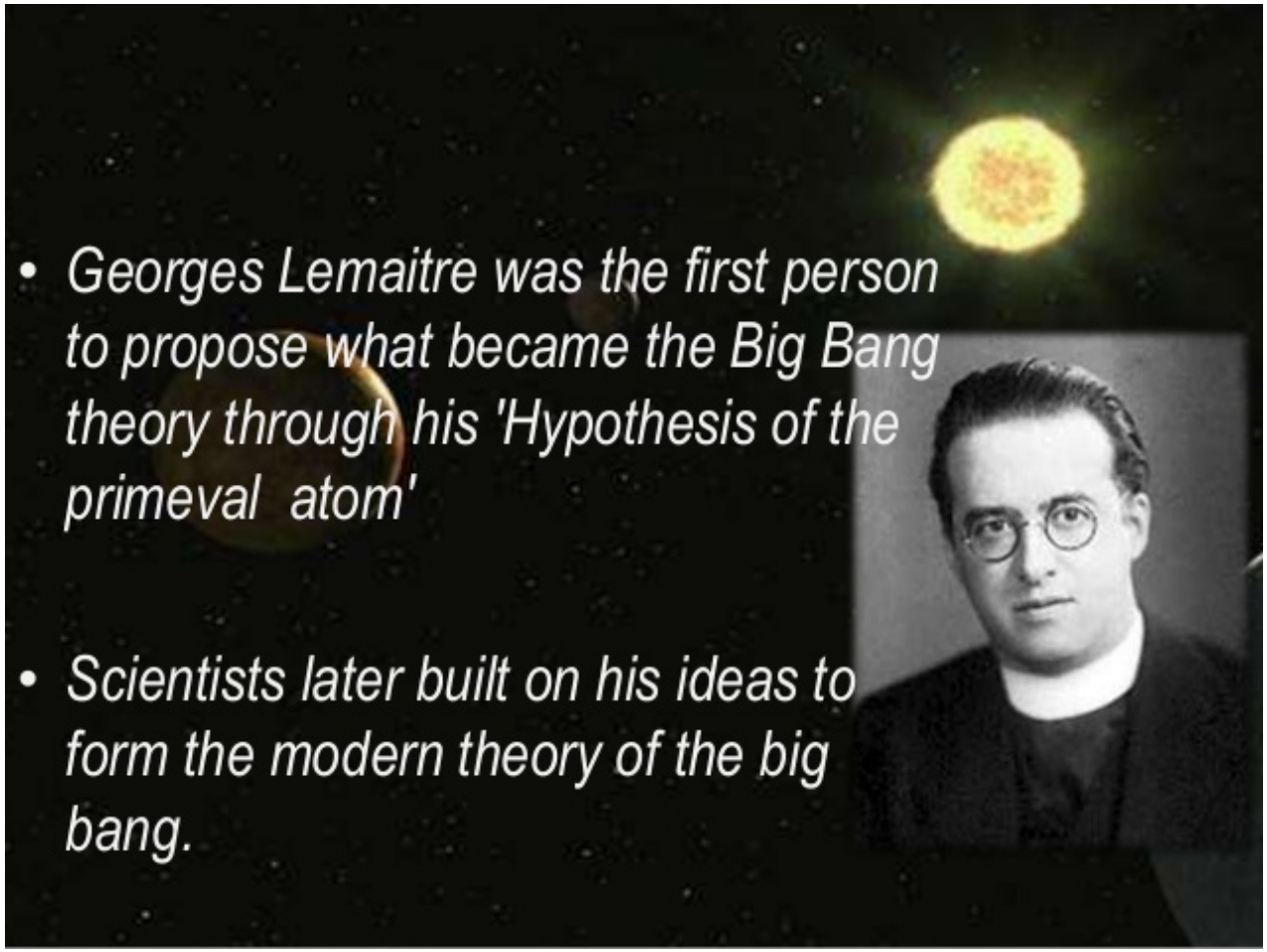
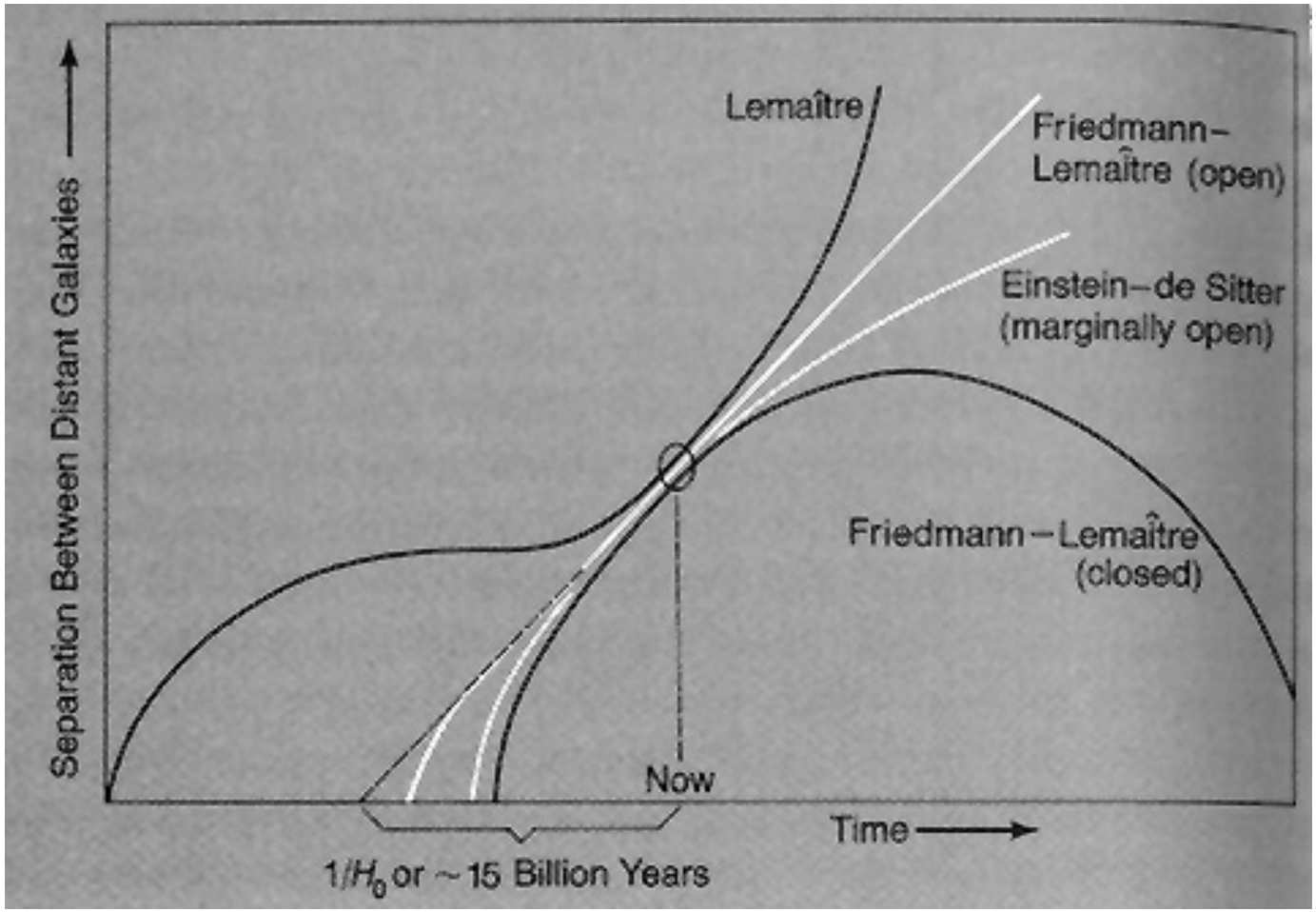
Miklahvellskenningin

Faðir Miklahvellskenningarinnar



Þróun mismunandi Miklahvells-heimslíkana



Uppruni frumefnanna

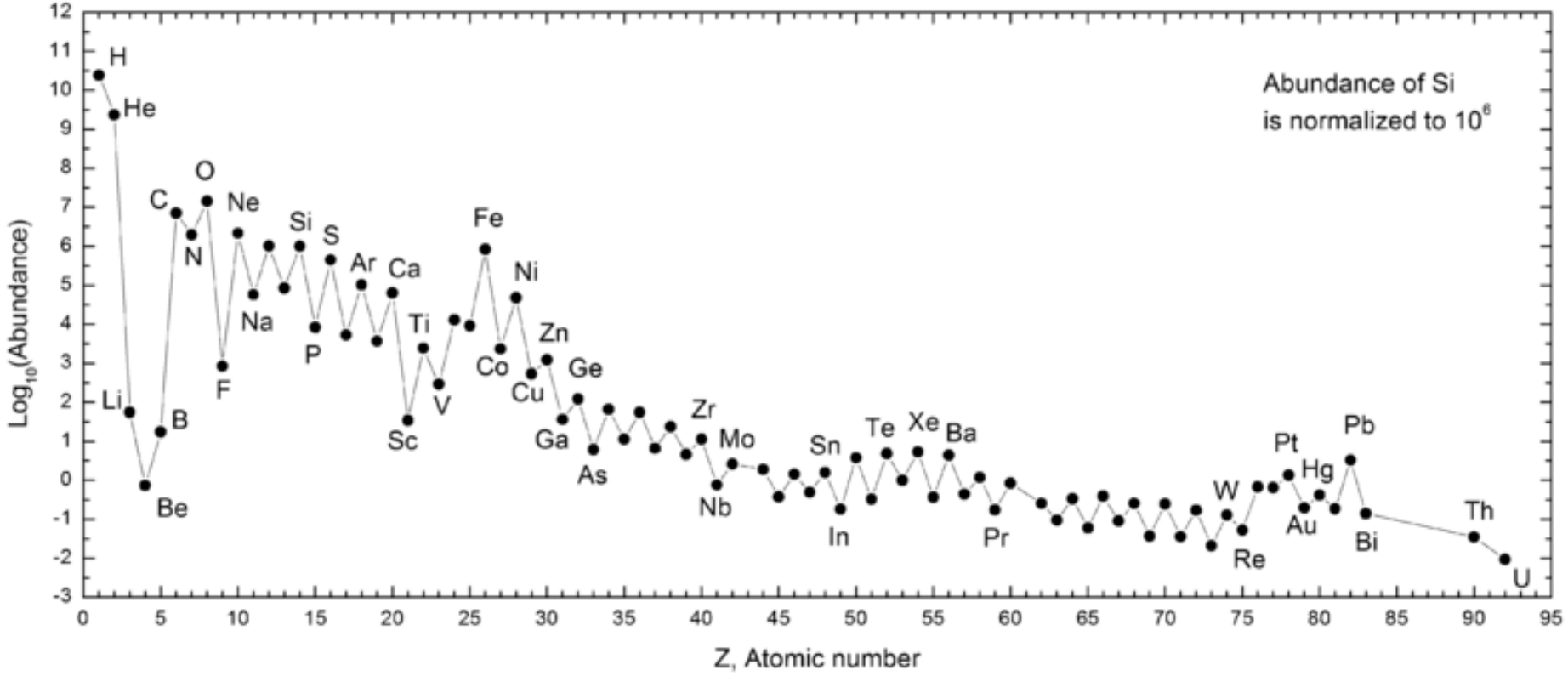
Lotukerfið

PERIODIC TABLE OF THE ELEMENTS

1 **H** 1.008																	2 **He** 4.00
3 **Li** 6.94	4 **Be** 9.01											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.30											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.06	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.90	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.39	31 **Ga** 69.72	32 **Ge** 72.59	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.1	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.75	52 **Te** 127.60	53 **I** 126.91	54 **Xe** 131.29
55 **Cs** 132.91	56 **Ba** 137.33	57 ***La** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.85	75 **Re** 186.21	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.2	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.02	89 **†Ac** 227.03	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (266)	107 **Bh** (264)	108 **Hs** (277)	109 **Mt** (268)	110 **Ds** (271)	111 **Rg** (272)							

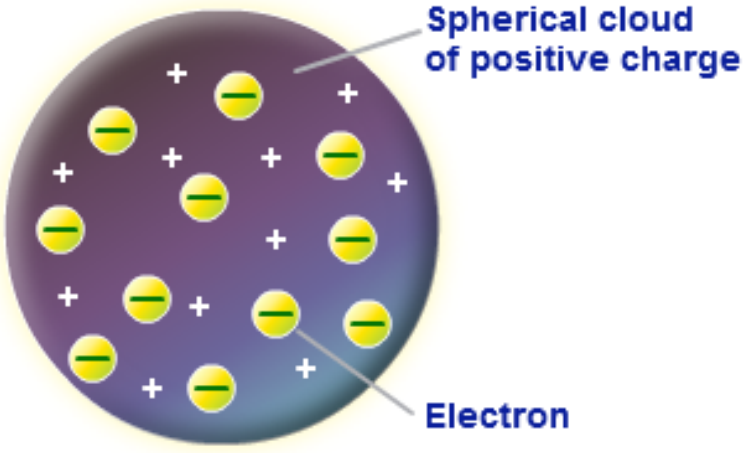
*Lanthanide Series	58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** (145)	62 **Sm** 150.4	63 **Eu** 151.97	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.93	70 **Yb** 173.04	71 **Lu** 174.97
†Actinide Series	90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (262)

Hlutfallslegt magn frumefna í sólkerfinu



Atómið

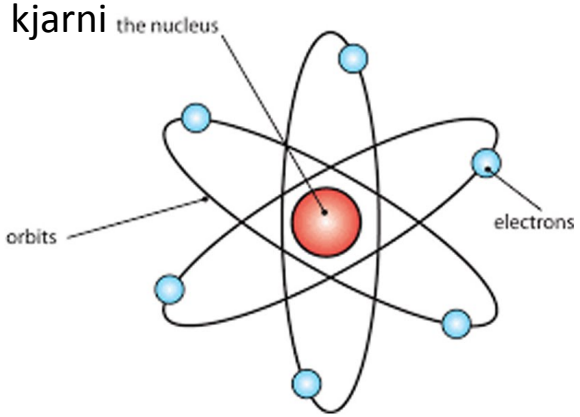
Atómlíkön Thomsons og Rutherfords



Thomson's Plum pudding model

1904

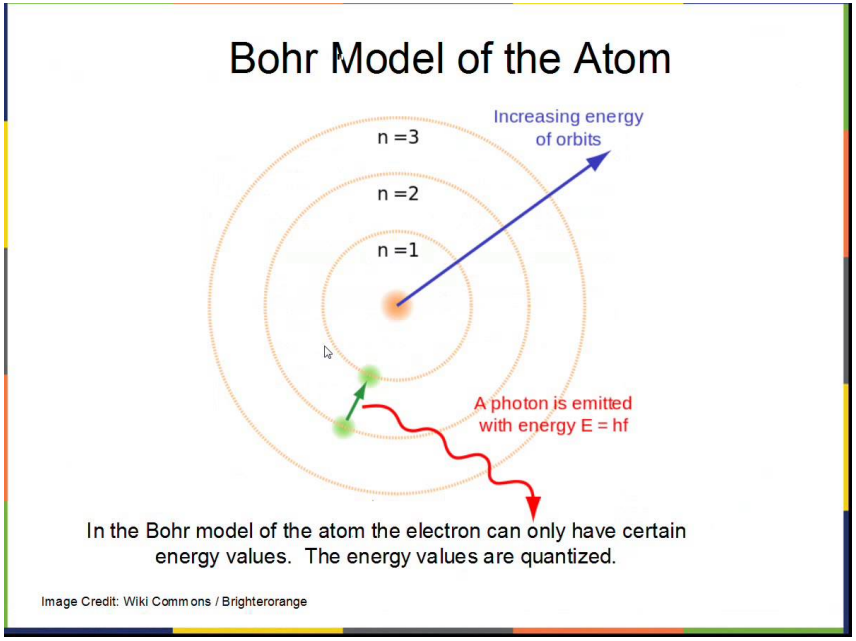
Jákvætt hlaðinn
kjarni

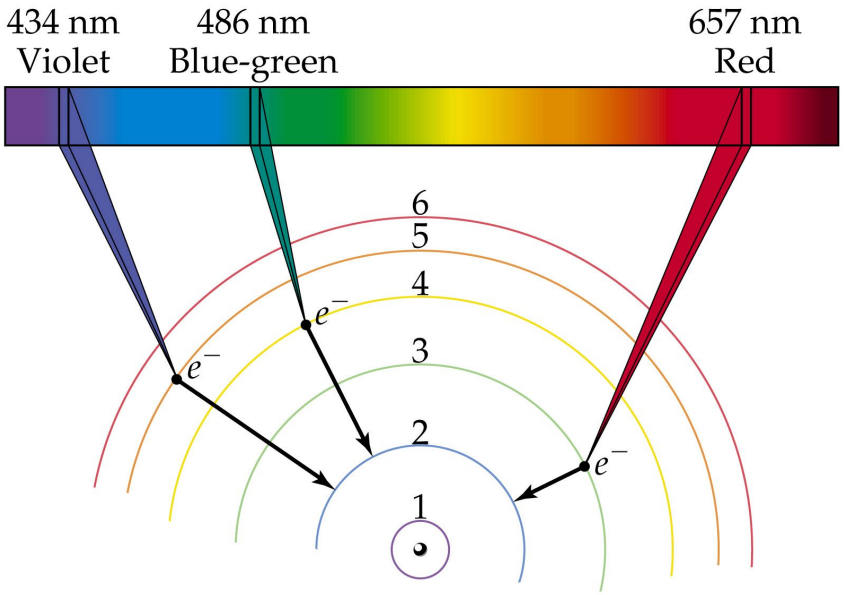


Rutherford's Model Of An Atom

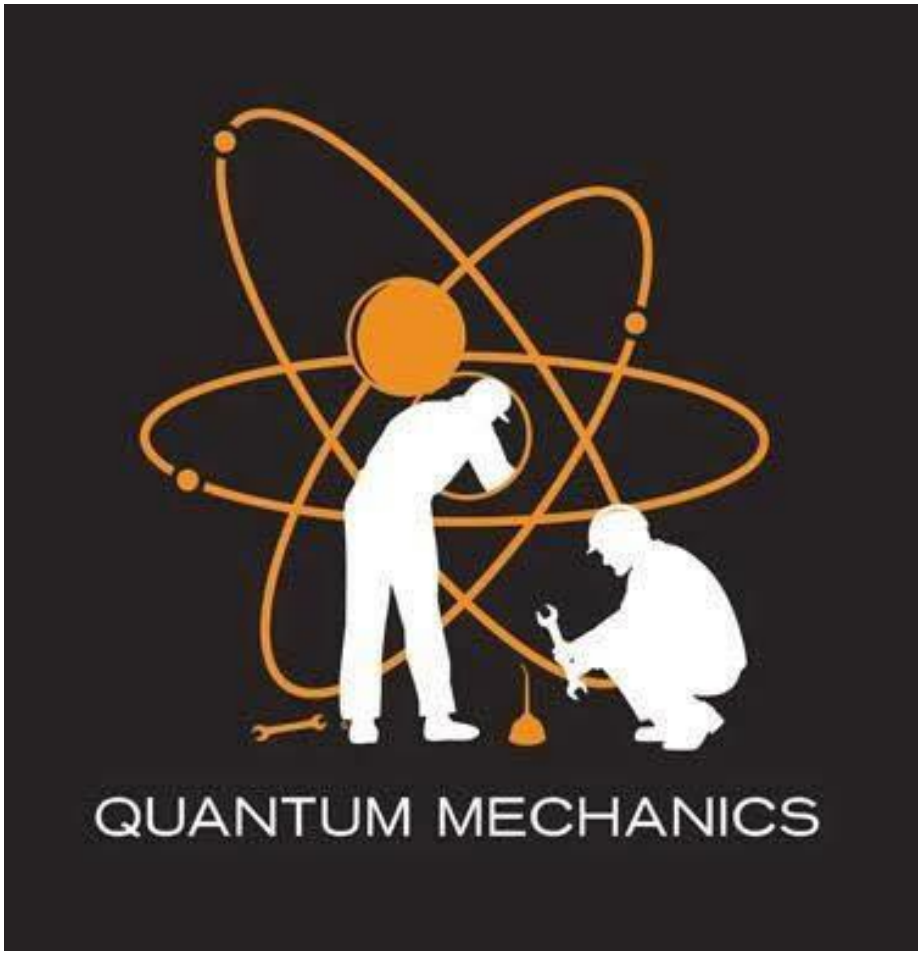
1911

Atómlíkan Bohrs frá 1913





Skammtafræði

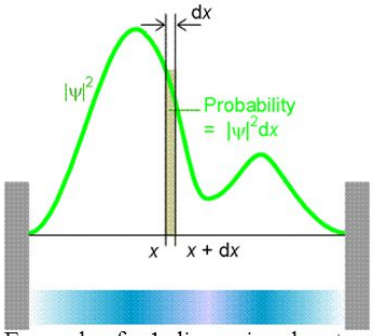


Bylgjufallið og líkindi

Each "particle" is represented by a wavefunction Ψ (position, time) such that $\Psi^*\Psi$ = the probability of finding the particle at that position at that time.

The wavefunction is used in the Schrodinger equation. The Schrodinger equation plays the role of Newton's laws and conservation of energy in classical mechanics - i.e., it predicts the future behavior of a dynamic system. It predicts analytically and precisely the probability of events or outcome. The detailed outcome depends on chance, but given a large number of events, the Schrodinger equation will predict the distribution of results.

1.3 The Born interpretation of the wavefunction

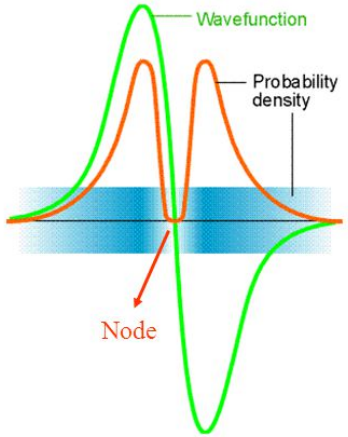


Example of a 1-dimensional system

➔ **Physical meaning of the wavefunction**:

If the wavefunction of a particle has the value $\psi(r)$ at some point r of the space, the ***probability of finding*** the particle in an infinitesimal volume $d\tau$=dxdydz at that point is proportional to $|\psi(r)|^2 d\tau$

- $|\psi(r)|^2 = \psi(r)\psi^*(r)$ is a ***probability density***. It is always positive! Hence, if the wavefunction has a negative or complex value, it does not mean that it has no physical meaning… because what is important is the value of $|\psi(r)|^2 \geq 0$; for all r. But, the change in sign of $\psi(r)$ in space (presence of a node) is interesting to observe in chemistry: antibonding orbital overlap (see chap 4: Electronic structure in molecules).



Skammtafræðilegt líkan af vetnisatóminu

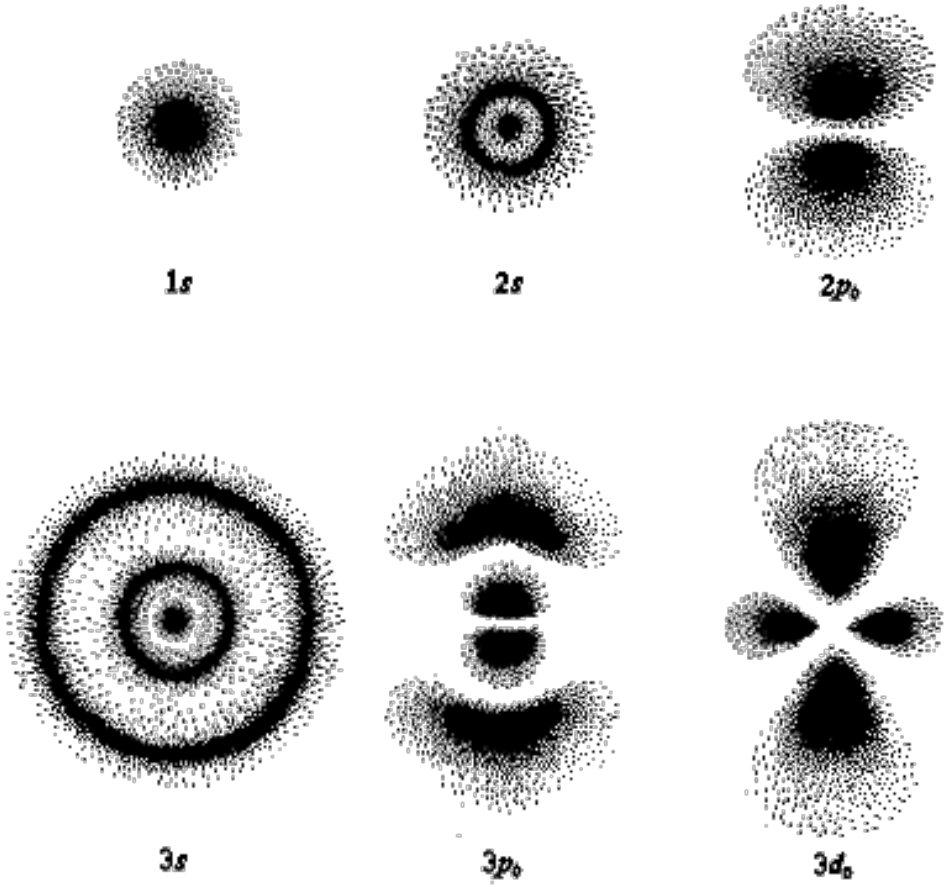
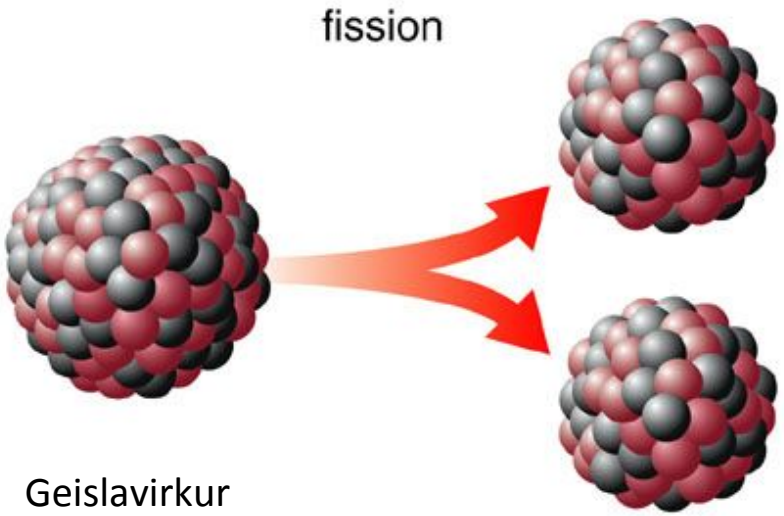


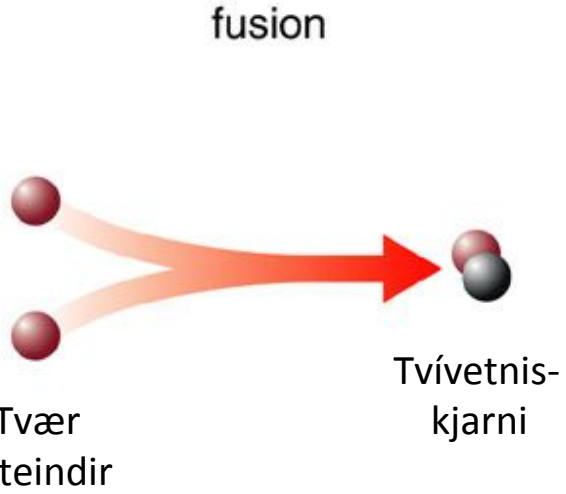
Figure 6-12. Probability density plots of some hydrogen atomic orbitals. The density of the dots represents the probability of finding the electron in that region.

Kjarnahvörf

Kjarnasundrun

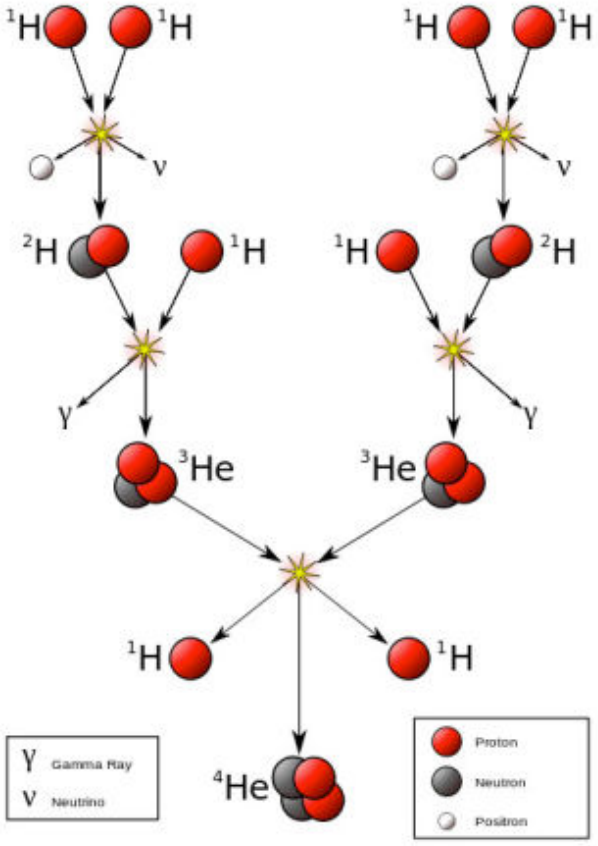


Kjarnasamruni

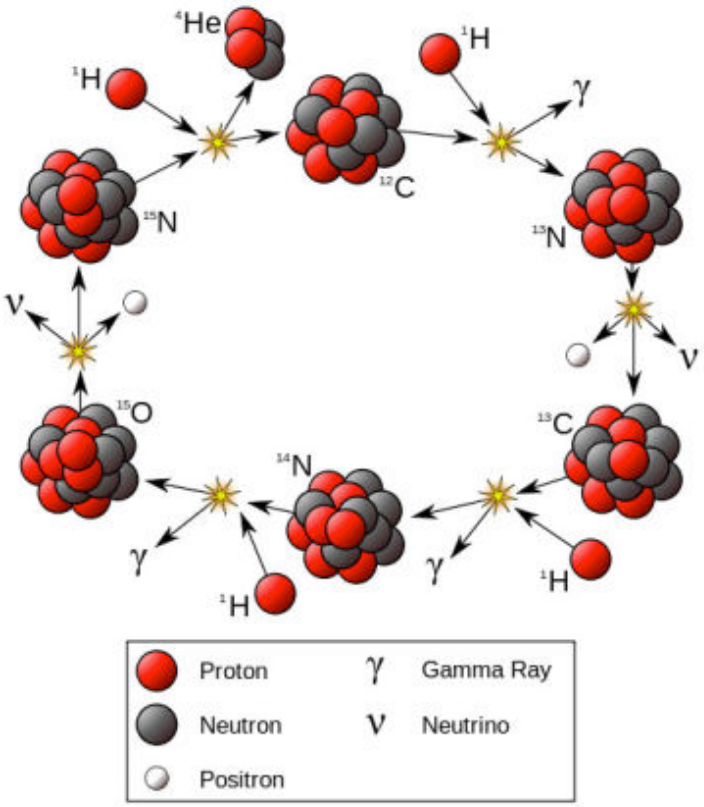


Sólstjörnur

Kjarnasamruni í sólstjörnum I
Hans Bethe 1939

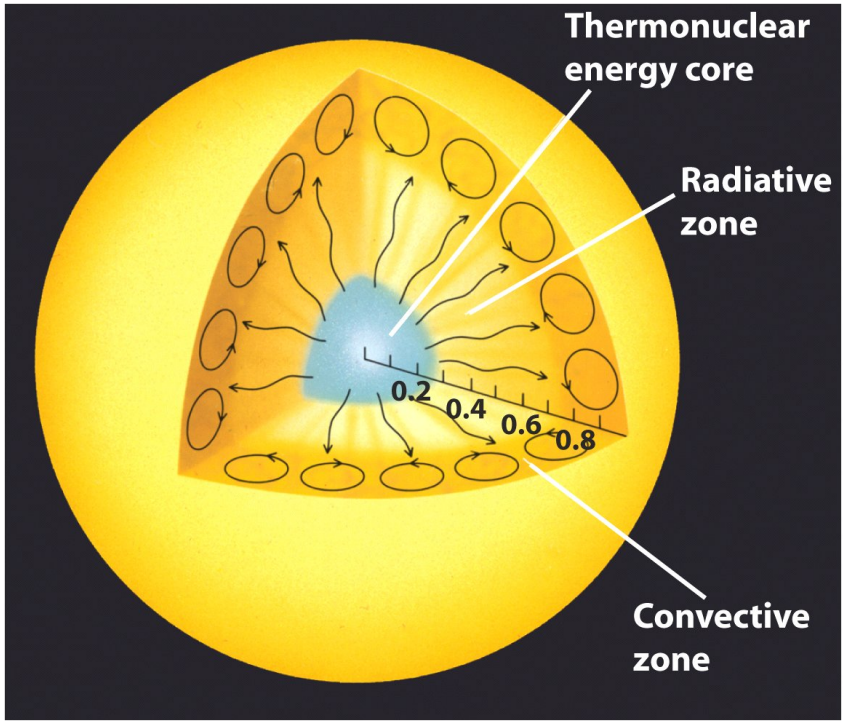


Meginröð:
Massi minni en 1,3 sólarmassar

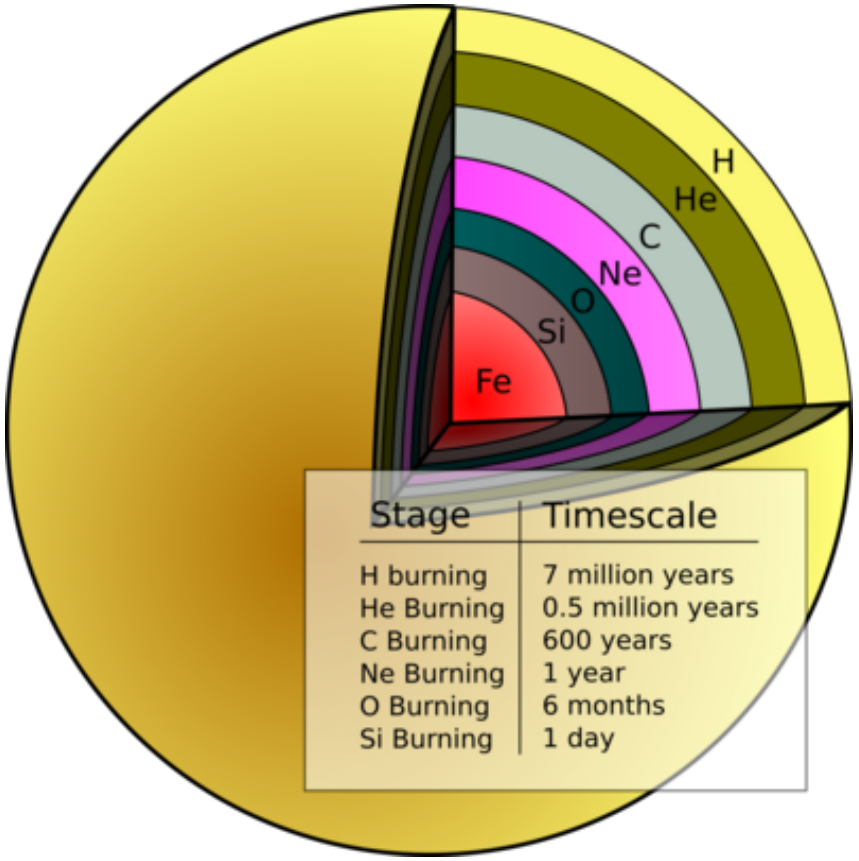


Meginröð:
Massi stærri en 1,3 sólarmassar

Þróun sólstjarna I

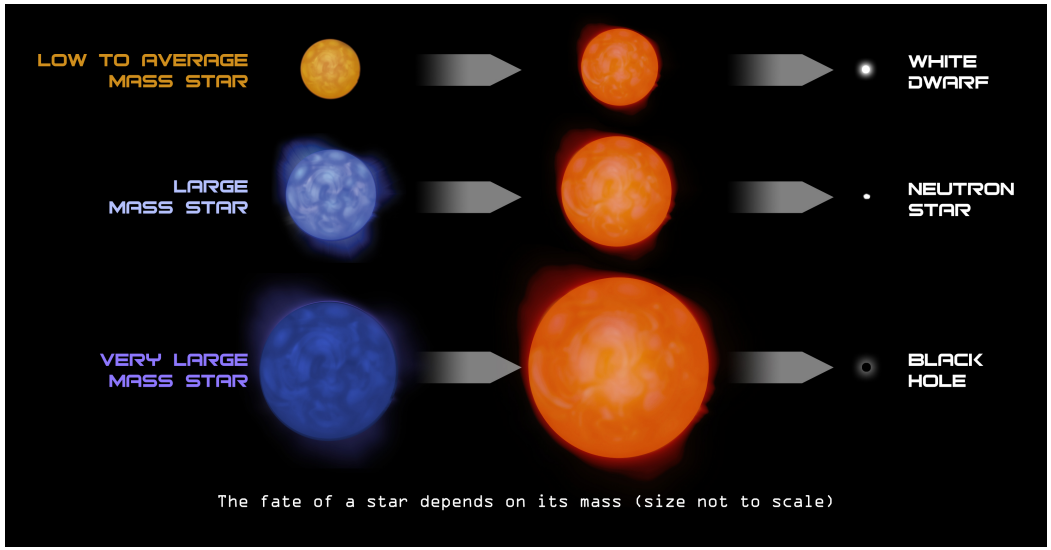


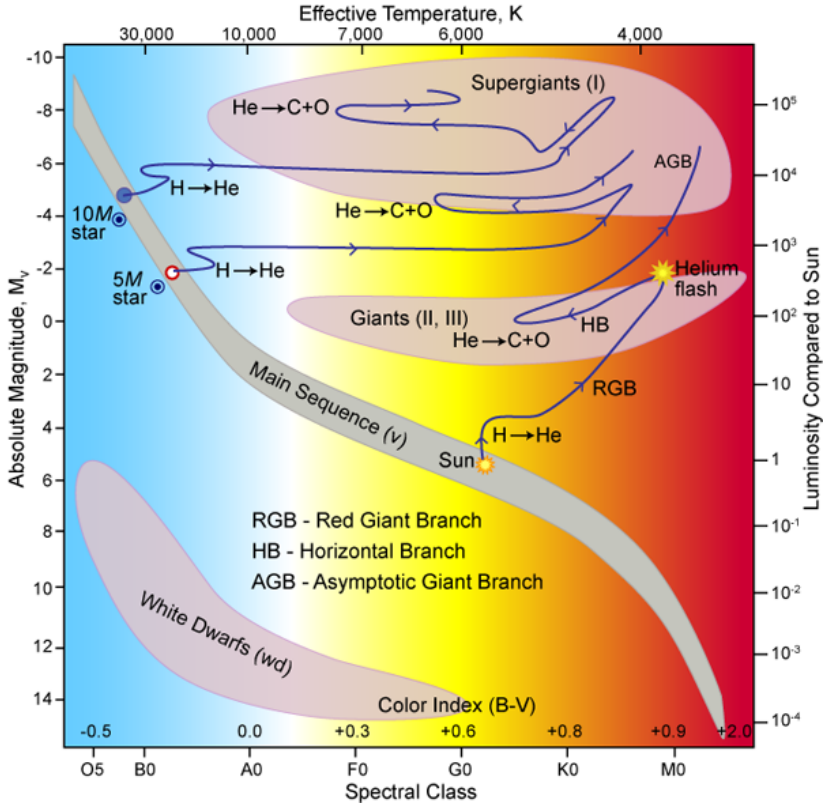
Innri gerð sólar á meginröð



Lokastig massamikillar stjörnu (meiri en 20 sólarmassar) áður en hún springur

Þróun sólstjarna II





Þróunin í Hertzsprung-Russell línuriti

The Origin of the Solar System Elements

big bang fusion 

cosmic ray fission 

merging neutron stars 

exploding massive stars 

dying low mass stars 

exploding white dwarfs 

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra																
			57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
			89 Ac	90 Th	91 Pa	92 U											