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Quantum Prehistory

1. 1633 - First attempt to describe the light as a substance was by Renee Decartes - he claimed that white light becomes colored when it is refracted.
2. 1666: White light was made up of colors of rainbow Isaac Newton:
Newton showed that by using the second prism to get white light back to white,
proving that white = sum of colored lights.
He then took the monochromatic component passing it from the prism and showing the
no further colors are generated.
3. 1752: Scottish physicist Thomas Melville: Observed the dark gaps and bright lines in the spectrum of the burning light.
4. 1802 William Wollaston Solar light has dark gaps - something is burning there
5. 1814 Joseph von Fraunhofer recognized the stability of dark lines from Sun.
6. 1820: John Herschel recognized that bright lines are specific to a material.
7. 1849: Leon Foucault: connected the bright light of burning substances with the dark lines of Sun for Carbon.
8. 1853: Swedish Andres Angstrom observed the spectrum of Hydrogen.
9. 1855-1863: Robert Bunsen and Gustav Kirchhoff: systematic study of the spectral lines:
10. 1869: Joseph Lockyer found a Doppler shift in spectral lines from the Sun. He found a new spectrum never seen before, calling it Helium
11. 1895: Sir William Ramsay found Helium on earth
12. 1885: Johann Balmer² analyzing Hydrogen lines: $\lambda = b(n^2/n'^2 - 4)$, $b = 3645.6$ Angstrom, $n = 3, 4, 5, 6$
 $B = 364.5 \text{ nm}$
13. 1888: Johannes Rydberg $1/\lambda = R(1/n'^2 - 1/n^2)$ $R = 109,737 \text{ cm}^{-1}$ Rydberg constant
14. 1895: Wilhelm Roentgen, produced and detected [electromagnetic radiation](#) in a [wavelength](#) range known as [X-rays](#) or Röntgen rays. 001-10nm (400 - 700 nm)
15. 1897: J.J. Thomson, discovered electron - Atom is not - indivisible and contains electrons
16. 1900: Speaking on December 14th 1900 at the meeting of the German Physical Society, **Max Planck** stated that paradoxes pestering the classical theory of the emission and absorption of the light by material bodies could be removed if one assumes that **radiant energy can exist only in the form of the discrete packages**

Planck called these packages **light quanta**
17. 1905: **Albert Einstein** successfully applied the idea of light quanta to explain the empirical laws of **photoelectric effect**; that is the emission of electrons from metallic surfaces irradiate by violet and ultraviolet light.
18. Arthur Compton proved that the light is a quantum
19. 19011 Ernst Rutherford discovered atomic nuclei
20. 1913 Niels Bohr extended Planck's ide of quantization of radiant energy to the description of mechanical energy of electrons within an atom. Introducing specific quantization rules for mechanical system of atomic sizes.
Achieved
the logical explanation of t Ernest Rutherford's planetary model of an atom which contradicted the fundamental concepts of classical mechanics/electrodynamics. Bohr model could not describe the level transitions and intensity of lines.
- 21 1925: Lois de Broglie: Interpretation of Bohr quantum orbits. Motion of each electrons in the atomic orbits are governed by some mysterious Pilot Waves: Assuming that the length of the pilot waves are inverse proportional to electron momentum/velocity. Only those orbits exists for which wave can pack integer number of pilot waves:
Atom like a musical instruments: with the basic tone corresponding to the lowest energy.
- 22 1926 Max Born interpreted them as probability waves
- 23 1926: Erwin Schroedinger introduced Mechanics for these waves
- 24 1927 Werner Heizenberg introduced uncertainty principle.