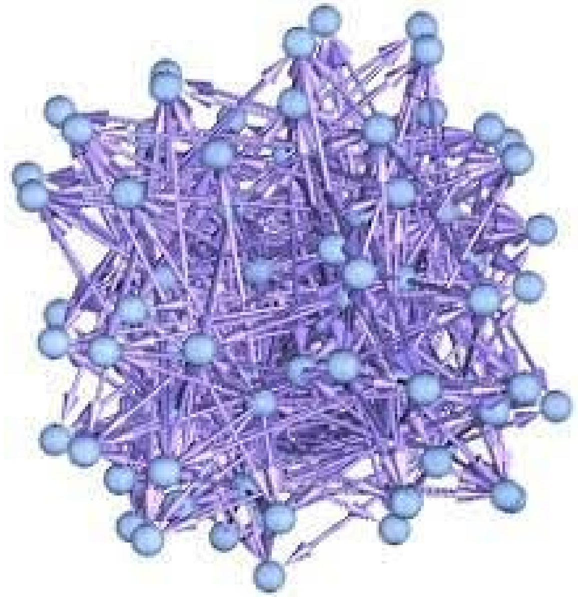
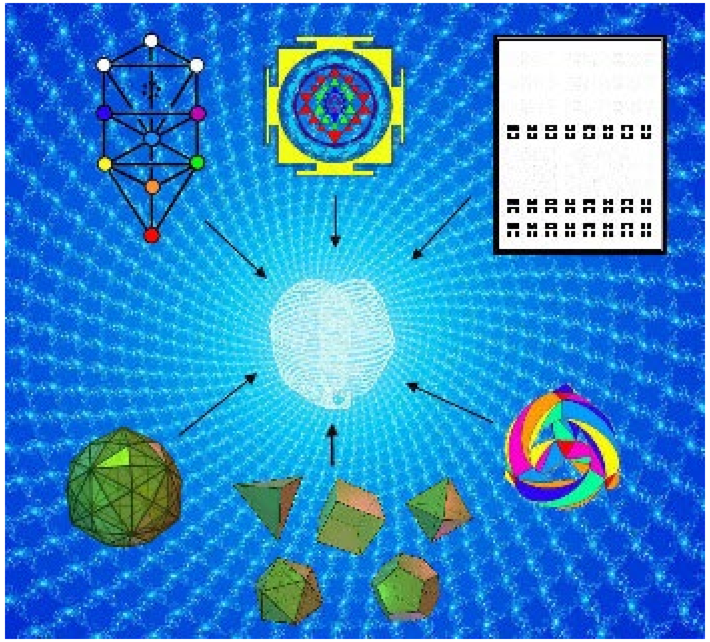
Evolution of Theory of the Atom



AlephTalks

26 October 2023



Outline

- Timeline
- The Road Not Taken
  - Nikola Tesla 1890-
  - De Broglie/Bohm 1925-1952
  - String Theory 1967 in 10/11 Dimensions
- The 1975 Standard Model
- What Is Next

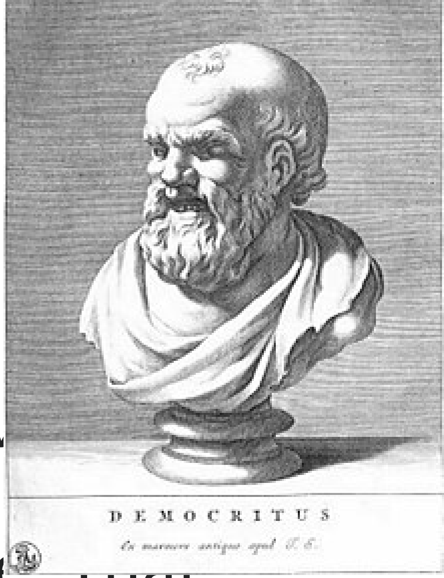
Timeline

- 442 BC Democritus: All matter is made up of atoms
- 1803: John Dalton Experimental evidence for atoms
- 1830: Michael Faraday: electricity is related to atoms
- 1847: Hermann Grassmann: electrodynamic
- 1961-1865: James Clerk Maxwell: equations of electromagnetism
- 1887-1888: Heinrich Hertz: spark transmission of electromagnetic waves
- 1890-1893: Nikola Tesla etheric electromagnetism
- 1895 Wilhelm Roentgen XRays
- 1898 JJ Thomson jelly model of positive charge
- 1908 Leadbeater and Besant publish Occult Chemistry
- 1908: Robert Millikan measurement of negative charge on electron

Timeline

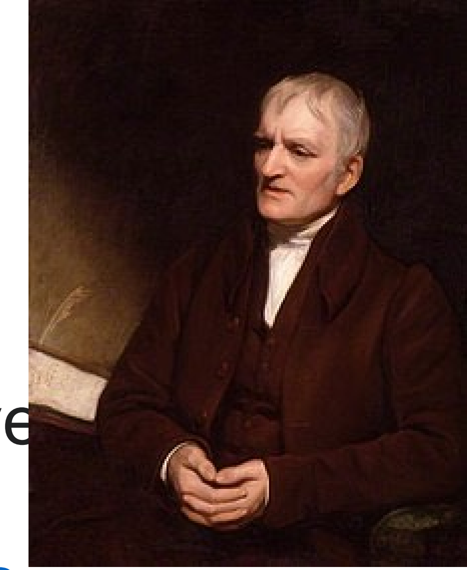
- 1909: Ernest Rutherford scattering shows nucleus with electron cloud
- 1924 Louis De Broglie duality of matter and waves
- 1926 Erwin Schroedinger quantum mechanics
- 1928 Paul Adrian Dirac relativistic quantum mechanics
- 1934 Irene Curie Frederic Joliot radioactive decay of neutron
- 1952 David Bohm pilot wave theory of quantum mechanics
- 1962 Murray Gellman George Zweig Quarks
- 1975 Glashow Salam Weinberg Weak force/electromagnetism united
- 1975 Standard Model
- 1990- Ron Cowen The Path of Love (2015)
- 2020 Stephen Wolfram ruliad algorithmic description

Democritus Atomic Theory 442BCE



- δοκεῖ δὲ αὐτῶι τάδε· ἀρχὰς εἶναι τῶν ὅλων ἀτόμους καὶ κενόν δ'ἀλλα πάντα νενομίσθαι [δοξάζεσθαι]. (Diogenes Laërtius, Democritus, Vol. IX, 44) Now his principal doctrines were these: That atoms and the vacuum were the beginning of the universe; and that everything else existed only in opinion. (trans. Yonge 1853)
- The theory of Democritus held that everything is composed of "atoms," which are physically, but not geometrically, indivisible; that between atoms, there lies empty space; that atoms are indestructible, and have always been and always will be in motion; that there is an infinite number of atoms and of kinds of atoms, which differ in shape and size.

John Dalton 1803



The main points of Dalton's atomic theory, as it eventually deve
are:

- Elements are made of extremely small particles called atoms.
- Atoms of a given element are identical in size, mass and other properties; atoms of different elements differ in size, mass and other properties.
- Atoms cannot be subdivided, created or destroyed.
- Atoms of different elements combine in simple whole-number ratios to form chemical compounds.
- In chemical reactions, atoms are combined, separated or rearranged.

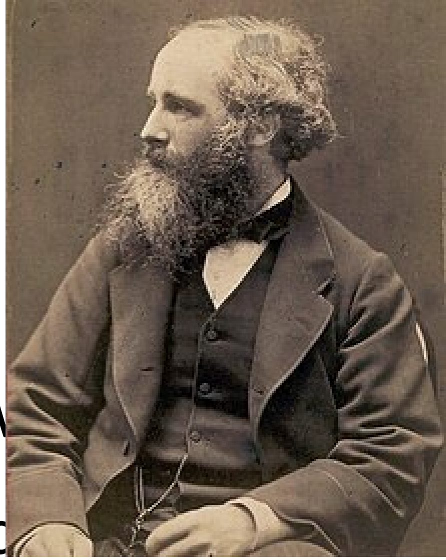
Michael Faraday 1830-1845

- In 1832, he completed a series of experiments aimed at investigating the fundamental nature of electricity; Faraday used "static", batteries, and "animal electricity" to produce the phenomena of electrostatic attraction, electrolysis, magnetism, etc.
- He concluded that, contrary to the scientific opinion of the time, the divisions between the various "kinds" of electricity were illusory. Faraday instead proposed that only a single "electricity" exists, and the changing values of quantity and intensity (current and voltage) would produce different groups of phenomena.
- This built on earlier work of Benjamin Franklin

Hermann Grassmann 1845 Electrodynamik

- **Hermann Günther Grassmann** (German: *Graßmann*, 15 April 1809 – 26 September 1877) was a German polymath known in his day as a linguist and now also as a mathematician. He was also a physicist, general scholar, and publisher. His mathematical work was little noted until he was in his sixties. His work preceded and exceeded the concept which is now known as a vector space. He introduced the Grassmannian, the space which parameterizes all *k*-dimensional linear subspaces of an *n*-dimensional vector space *V*.
- In 1847, he asked the Prussian Ministry of Education to be considered for a university position, whereupon that Ministry asked Ernst Kummer for his opinion of Grassmann. Kummer wrote back saying that Grassmann's 1846 prize essay contained "commendably good material expressed in a deficient form." Kummer's report ended any chance that Grassmann might obtain a university post. This episode proved the norm; time and again, leading figures of Grassmann's day failed to recognize the value of his mathematics.
- Grassmann wrote a variety of work applying his theory of extension, including his 1845 **Neue Theorie der Elektrodynamik** and several papers on algebraic curves and surfaces, in the hope that these applications would lead others to take his theory seriously.

James Clerk Maxwell 1861-1865 Equations of Electromagnetism

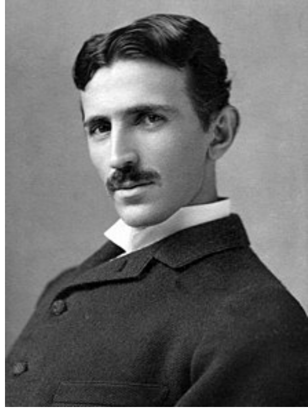


- James Clerk Maxwell FRSE FRS (13 June 1831 – 5 November 1879) v Scottish physicist with broad interests who was responsible for the theory of electromagnetic radiation, which was the first theory to d electricity, magnetism and light as different manifestations of the same phenomenon. Maxwell's equations for electromagnetism have been called the "second great unification in physics" where the first one had been realised by Isaac Newton.
- With the publication of "A Dynamical Theory of the Electromagnetic Field" in 1865, Maxwell demonstrated that electric and magnetic fields travel through space as waves moving at the speed of light. He proposed that light is an undulation in the same medium that is the cause of electric and magnetic phenomena. The unification of light and electrical phenomena led to his prediction of the existence of radio waves. Maxwell is also regarded as a founder of the modern field of electrical engineering.

Heinrich Hertz 1887-1888
Experiments on Electromagnetic Radiation

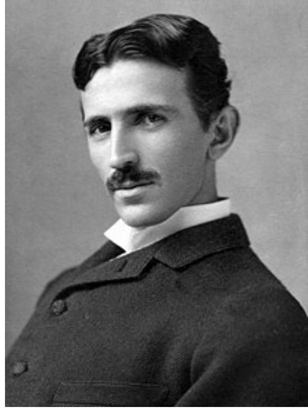
- **Heinrich Rudolf Hertz** (/hɜːrts/ *HURTS*; German, 22 February 1857 – 1 January 1894) was a German physicist who first conclusively proved the existence of the electromagnetic waves predicted by James Clerk Maxwell's equations of electromagnetism. The unit of frequency, cycle per second, was named the "hertz" in his honor.
- In the autumn of 1886, after Hertz received his professorship at Karlsruhe, he was experimenting with a pair of Riess spirals when he noticed that discharging a Leyden jar into one of these coils produced a spark in the other coil. He used a dipole antenna consisting of two collinear one-meter wires with a spark gap between their inner ends, and zinc spheres attached to the outer ends for capacitance, as a radiator. The antenna was excited by pulses of high voltage of about 30 kilovolts applied between the two sides from a Ruhmkorff coil. He received the waves with a resonant single-loop antenna with a micrometer spark gap between the ends. This experiment produced and received what are now called radio waves in the very high frequency range.

Nikola Tesla 1890-1893
Etheric Electromagnetism



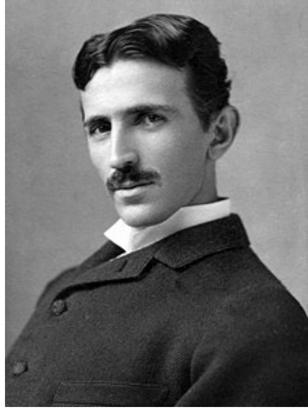
- In 1887, Tesla developed an induction motor that ran on alternating current (AC), a power system format that was rapidly expanding in Europe and the United States because of its advantages in long-distance, high-voltage transmission.
- The motor used polyphase current, which generated a rotating magnetic field to turn the motor (a principle that Tesla claimed to have conceived in 1882). This innovative electric motor, patented in May 1888, was a simple self-starting design that did not need a commutator, thus avoiding sparking and the high maintenance of constantly servicing and replacing mechanical brushes.

Nikola Tesla 1893
Etheric Electromagnetism



- In 1893, Edward Dean Adams, who headed the Niagara Falls Cataract Construction Company, sought Tesla's opinion on what system would be best to transmit power generated at the falls. Over several years, there had been a series of proposals and open competitions on how best to do it. Among the systems proposed by several US and European companies were two-phase and three-phase AC, high-voltage DC, and compressed air.
- Adams asked Tesla for information about the current state of all the competing systems. Tesla advised Adams that a two-phased system would be the most reliable and that there was a Westinghouse system to light incandescent bulbs using two-phase alternating current. The company awarded a contract to Westinghouse Electric for building a two-phase AC generating system at the Niagara Falls, based on Tesla's advice and Westinghouse's demonstration at the Columbian Exposition. At the same time, a further contract was awarded to General Electric to build the AC distribution system.

Nikola Tesla Xrays 1894



- Starting in 1894, Tesla began investigating what he referred to as radiant energy of "invisible" kinds after he had noticed damaged film in his laboratory in previous experiments[(later identified as "Roentgen rays" or "X-rays"). His early experiments were with Crookes tubes, a cold cathode electrical discharge tube. Tesla may have inadvertently captured an X-ray image—predating, by a few weeks, Wilhelm Röntgen's December 1895 announcement of the discovery of X-rays—when he tried to photograph Mark Twain illuminated by a Geissler tube, an earlier type of gas discharge tube. The only thing captured in the image was the metal locking screw on the camera lens.[128]
- In March 1896, after hearing of Röntgen's discovery of X-ray and X-ray imaging (radiography), Tesla proceeded to do his own experiments in X-ray imaging, developing a high-energy single-terminal vacuum tube of his own design that had no target electrode and that worked from the output of the Tesla coil (the modern term for the phenomenon produced by this device is *bremsstrahlung* or *braking radiation*). In his research, Tesla devised several experimental setups to produce X-rays. Tesla held that, with his circuits, the "instrument will ... enable one to generate Roentgen rays of much greater power than obtainable with ordinary apparatus".

Wilhelm Roentgen Xrays 1895

- In November 1895 Röntgen speculated that a new kind of ray might be responsible for what he had discovered experimentally in his laboratory . 8 November was a Friday, so he took advantage of the weekend to repeat his experiments and made his first notes. In the following weeks, he ate and slept in his laboratory as he investigated many properties of the new rays he temporarily termed "X-rays", using the mathematical designation ("X") for something unknown. The new rays came to bear his name in many languages as "Röntgen rays" (and the associated X-ray radiograms as "Röntgenograms").
- At one point while he was investigating the ability of various materials to stop the rays, Röntgen brought a small piece of lead into position while a discharge was occurring. Röntgen thus saw the first radiographic image: his own flickering ghostly skeleton on the barium platinocyanide screen. He later reported that it was at this point that he decided to continue his experiments in secrecy, fearing for his professional reputation if his observations were in error.
- X rays will be used to carry out measurements on a variety of atoms

J J Thomson 1898
Positive charge jelly model

- In 1897, Thomson showed that cathode rays were composed of previously unknown negatively charged particles (now called electrons), which he calculated must have bodies much smaller than atoms and a very large charge-to-mass ratio.
- Thomson believed that the corpuscles emerged from the atoms of the trace gas inside his cathode ray tubes. He thus concluded that atoms were divisible, and that the corpuscles were their building blocks.
- In 1904, Thomson suggested a model of the atom, hypothesizing that it was a sphere of positive matter within which electrostatic forces determined the positioning of the corpuscles. To explain the overall neutral charge of the atom, he proposed that the corpuscles were distributed in a uniform sea of positive charge. In this "plum pudding model", the electrons were seen as embedded in the positive charge like raisins in a plum pudding (although in Thomson's model they were not stationary, but orbiting rapidly).

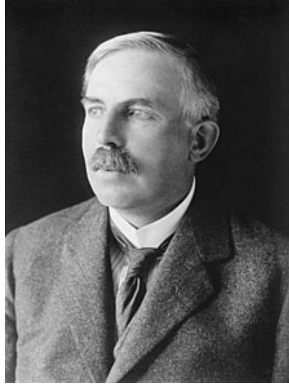
Charles Leadbeater Annie Besant Occult Chemistry 1908

- Deep meditation leading to clairvoyance and kinetic forces
- Atom consists of a nucleus and a cloud of electrons, with the number of positively charged protons in the nucleus equal to the number of negatively charged electrons
- Isotopes arise when atoms have the same number of protons and electrons but differing number of neutrons
- Each proton is made up of three quarks, each neutron is made up of three different quarks
- Each quark is made up of three subquarks of different types

Robert Millikan Charge on Electron 1908

- In 1909 Millikan began a series of experiments to determine the electric charge carried by a single electron. He began by measuring the course of charged water droplets in an electric field. The results suggested that the charge on the droplets is a multiple of the elementary electric charge, but the experiment was not accurate enough to be convincing.
- He obtained more precise results in 1910 with his oil-drop experiment in which he replaced water (which tended to evaporate too quickly) with oil.

Ernest Rutherford 1909
Alpha Particle Scattering



- Rutherford's discoveries include the concept of radioactive half-life, the radioactive element radon, and the differentiation and naming of alpha and beta radiation.
- Together with Thomas Royds, Rutherford is credited with proving that alpha radiation is composed of helium nuclei.
- In 1911, he theorized that atoms have their charge concentrated in a very small nucleus. This was done through his discovery and interpretation of Rutherford scattering during the gold foil experiment performed by Hans Geiger and Ernest Marsden, resulting in his conception of the Rutherford model of the atom

Louis de Broglie 1924

- In his 1924 PhD thesis, he postulated the wave nature of electrons and suggested that all matter has wave propertie concept is known as the de Broglie hypothesis, an example o particle duality, and forms a central part of the theory of quantum mechanics.
- De Broglie won the Nobel Prize for Physics in 1929, after the wave-like behaviour of matter was first experimentally demonstrated in 1927.
- The 1925 pilot-wave model,[7] and the wave-like behaviour of particles discovered by de Broglie was used by Erwin Schrödinger in his formulation of wave mechanics.The pilot-wave model and interpretation was then abandoned, in favor of the quantum formalism, until 1952 when it was rediscovered and enhanced by David Bohm.

Irwin Schroedinger 1926
Nonrelativistic Quantum Mechanics

- In January 1926, Schrödinger published in Annalen der Physik the paper "Quantisierung als Eigenwertproblem" (Quantization as an Eigenvalue Problem)on wave mechanics and presented what is now known as the Schrödinger equation. In this paper, he gave a "derivation" of the wave equation for time-independent systems and showed that it gave the correct energy eigenvalues for a hydrogen-like atom.
- A second paper was submitted just four weeks later that solved the quantum harmonic oscillator, rigid rotor, and diatomic molecule problems and gave a new derivation of the Schrödinger equation.
- A third paper, published in May, showed the equivalence of his approach to that of Heisenberg and gave the treatment of the Stark effect.

Paul Adrian Maurice Dirac
Relativistic Quantum Mechanics 1928

- Dirac made fundamental contributions to the early development of both quantum mechanics and quantum electrodynamics, coining the latter term.
- Among other discoveries, he formulated the Dirac equation which describes the behaviour of fermions and predicted the existence of antimatter
- It is considered one of the most important equations in physics, with it being considered by some to be the "real seed of modern physics".

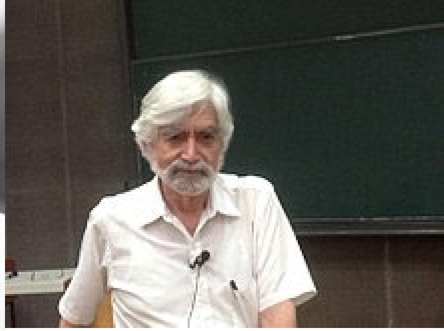
Irene Joliot-Curie and Frederic Joliot Radioactive Decay of Neutron 1933

- As she neared the end of her doctorate in 1924, Irène Curie was asked teach the precision laboratory techniques required for radiochemical research to the young chemical engineer Frédéric Joliot, whom she would later wed.
- From 1928 Joliot-Curie and her husband Frédéric combined their research efforts on the study of atomic nuclei.
- in 1933, Joliot-Curie and her husband were the first to calculate the accurate mass of the neutron.The Joliot-Curies continued trying to get their name into the scientific community; in doing so they developed a new theory from an interesting experiment they conducted. During an experiment bombarding aluminium with alpha rays, they discovered that only protons were detected. Based on the undetectable electron and positron pair, they proposed that the protons changed into neutrons and positrons

David Bohm 1952
Pilot Wave Theory of Quantum Mechanics

- Among his many contributions to physics is his causal and deterministic interpretation of quantum theory known as De Broglie–Bohm theory.
- Bohm advanced the view that quantum physics meant that the old Cartesian model of reality—that there are two kinds of substance, the mental and the physical, that somehow interact—was too limited.
- To complement it, he developed a mathematical and physical theory of "implicate" and "explicate" order.
- He also believed that the brain, at the cellular level, works according to the mathematics of some quantum effects, and postulated that thought is distributed and non-localised just as quantum entities are.
- Bohm's main concern was with understanding the nature of reality in general and of consciousness in particular as a coherent whole, which according to Bohm is never static or complete.

Murray Gellman George Zweig Quarks 1962

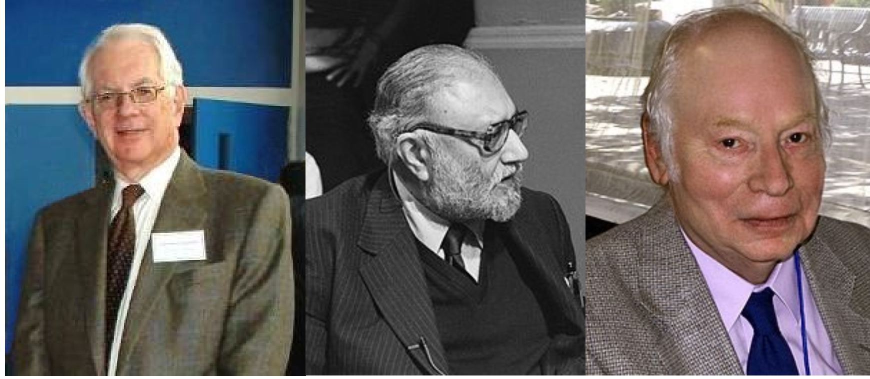


- Gell-Mann introduced the concept of quarks as the fundamental building blocks of the strongly interacting particles, and the renormalization group as a foundational element of quantum field theory and statistical mechanics. He played key roles in developing the concept of chirality in the theory of the weak interactions and spontaneous chiral symmetry breaking in the strong interactions, which controls the physics of the light mesons.
- Zweig proposed the existence of quarks at CERN, independently of Murray Gell-Mann, shortly after defending his PhD dissertation. Zweig dubbed them "aces", after the four playing cards, because he speculated there were four of them (on the basis of the four extant leptons known at the time).[3][4] The introduction of the concept of quarks provided a cornerstone for particle physics.

Four Forces of Western Physics

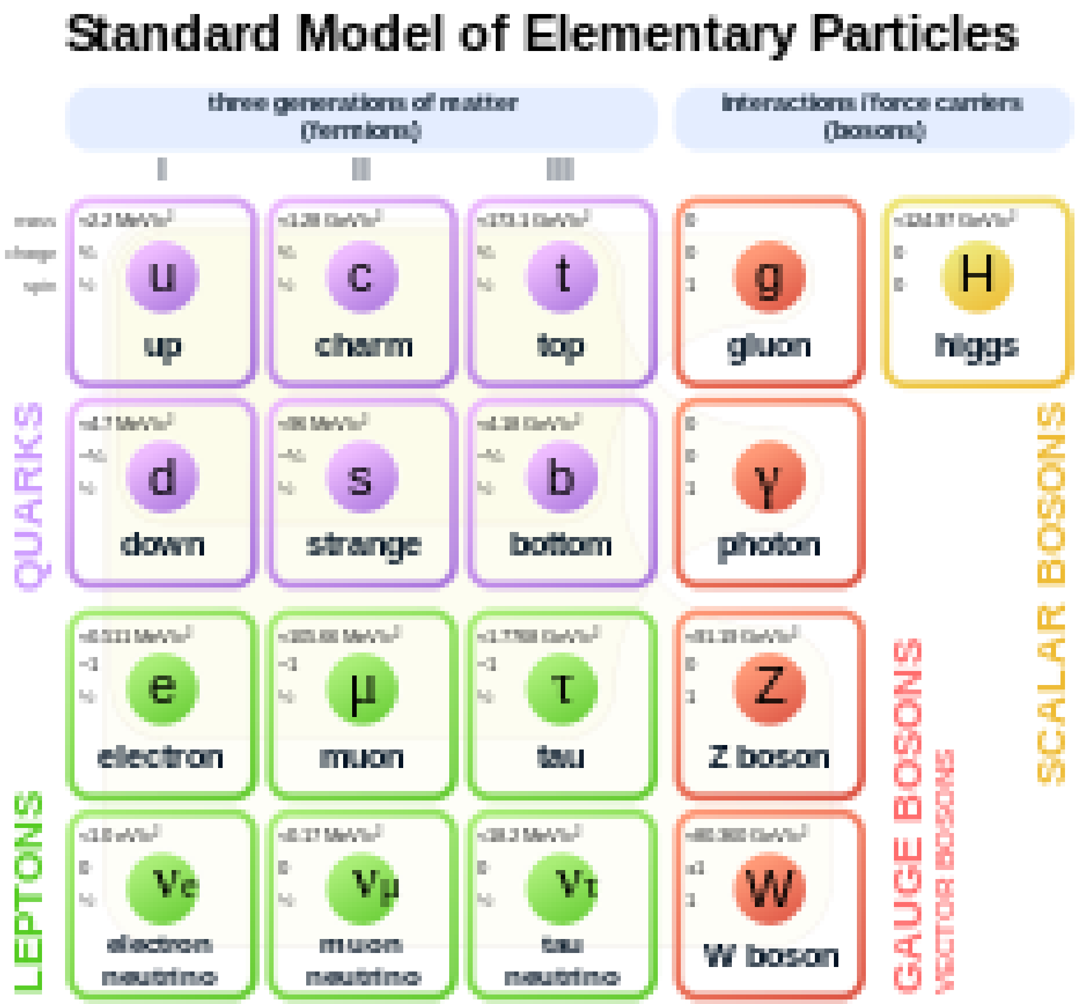
- Gravity (Newton 1687, Einstein 1916)
- Electromagnetism (Maxwell 1862; Heaviside 1880)
- Strong Force (Gellman, Zweig, 1971)
- Weak Force (Sheldon Glashow, Abdus Salam, Steven Weinberg, 1965)
- In reality, these are all part of a single theory of etheric electromagnetism, combining electromagnetism in free space with the fluid mechanics of the ether of the quantum foam of space

Sheldon Glashow, Abdus Salam, Steven Weinberg: 1965 weak force

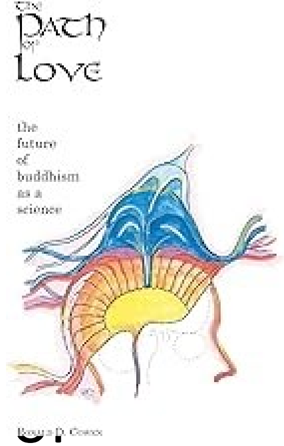


- the **weak interaction**, which is also often called the **weak force** or **weak nuclear force**, is one of the four known fundamental interactions
- It is the mechanism of interaction between subatomic particles that is responsible for the radioactive decay of atoms: The weak interaction participates in nuclear fission and nuclear fusion

Standard Model of Physics 1975



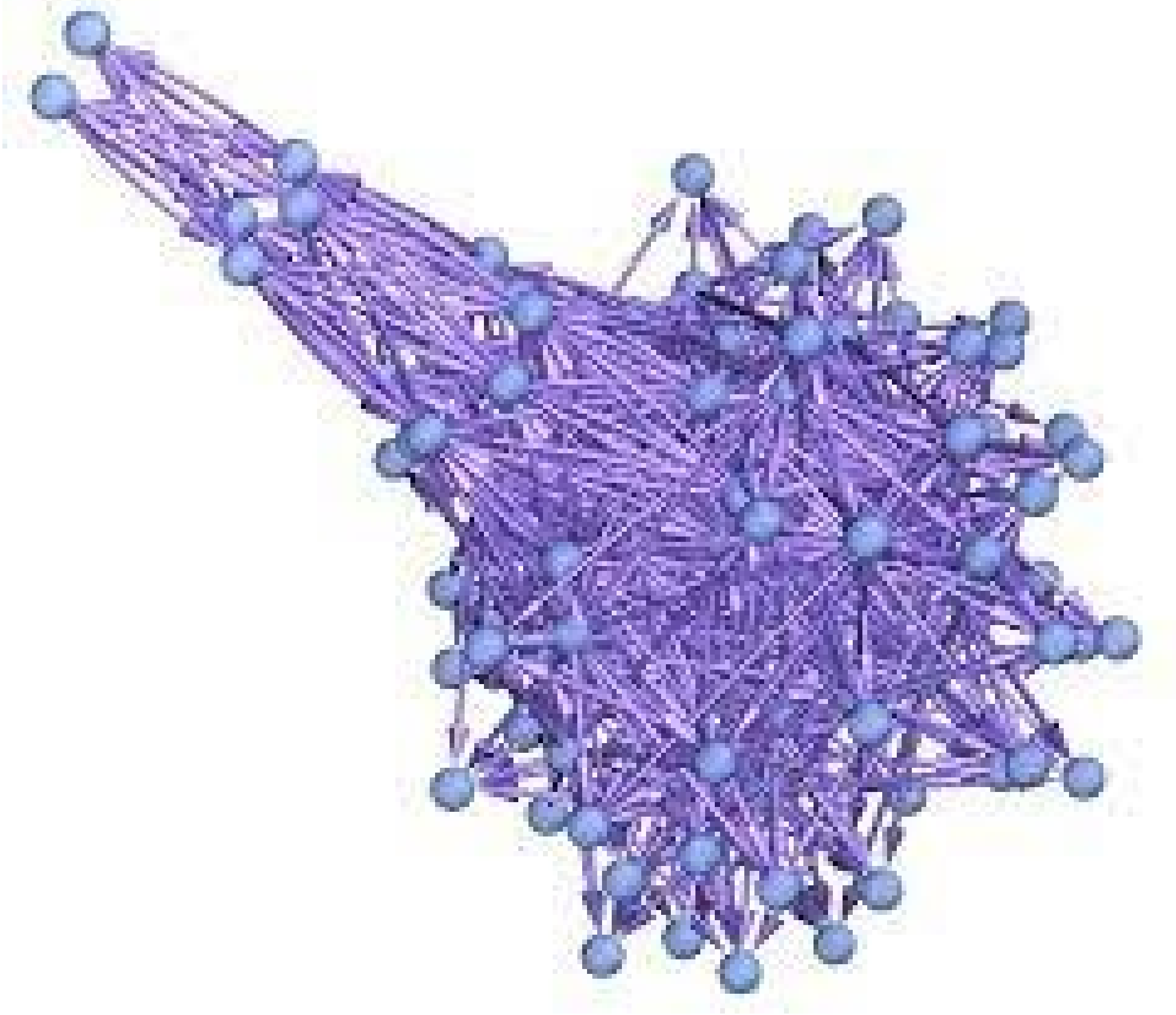
Ron Cowen, 1990-



Deep meditation leading to clairvoyance and kinetic control, confirmed all of Leadbeater and Besant observations plus

- Observed dark matter as well as matter
- Observed information blocks and scans/double slit experiment
- Observed subquarks and associated strings
- Observed neutrinos, photons, gravitons
- Observed quantum space compartments coated with information blocks
- Observed the Big Bounce at start of time
- Observed creation Higgs boson for matter and dark matter at Big Bounce
- Observed 26 real dimensional universe and its subspaces

Stephen Wolfram: The Ruliad 2020
Rules of Information Rules All



Open Issues for Next Class

- How to reconcile quantum mechanics description in the small with gravitation in the large?
- How to reconcile string theory needing 10/11 dimensions when we seem to live in four dimensional space time?
- How to reconcile that after five hundred years of study that Western science is studying 5 percent of the universe and has no explanation for the remaining 95 percent
- How to reconcile synchronicity
- How to reconcile consciousness
- How to reconcile cosmology and cycles of birth and death of the universe