12. Retrospection

The State of and Some Important Events in Science and the NEW MODEL

Summarized by Gy. I. Szász, the /07/02/2005

The **bold face** written statements give **the basics of the New Model**. The statements with quotation (") are questioned.

Year	Experimental Results
1610	Discovery of Jupiter moons. Fall experiments with different materials, ~10^{-2} accuracy. (G. Galilei)
1628	De muto cordis etsan quinis (W. Harvey)
1676	**Measurement of the light velocity *c***. (O. Römer)
1686	Pendulum: $m^I = m^G$ with ~10^{-3} accuracy. (I. Newton)
1710	Mercury Thermometer. (D. G. Fahrenheit)
1747	**Separation of + and - electric charges**. (W. Watson, B. Franklin)
1775	**The law of electrostatic force.** (C. A. Coulomb)
1789	Introduction of chemical elements. (A. L. Lavoisier)
1798	G = 6.74(5)x10^{-11} $m^3 kg^{-1} s^{-2}$ (H. Cavendish)
1800	Galvanic cells. (L. Galvani, A . Volta)
1812	**Equivalence of gravity and electrostatics.** (D. Poisson)
1820	**Discovery of electromagnetism**. (H. C. Örsted)
1825	Electrodynamics units. (A. M. Ampére)
1831	**The electric induction**. (M. Faraday)
1832	Pendulum: "$m^I = m^G$ with 5x10^{-5} accuracy" with some known materials. (F. W. Bessel)

Year	Technical Advantages
1590	Discovery of microscopes (Z. Janson)
1637	Optical instruments. (R. Descartes) Microscopes and telescopes, (E. Torricelli)
1740	Temperature scale (A. Celsius)
1780	Calorimeter (J. K. Wilcke, A. L. Lavoisier)
1832	Electrolysis. (M. Faraday)
1833	Inductors, electric machines.

Year	Theoretical Mile Stones
1543	Heliocentric world system. (N. Copernicus)
1609-	Discorti: Hypothesis of *"the Universality of Free Fall"* (UFF), introduction of the mass and kinetics. (G. Galilei) "*The laws of planets motions*". (J. Kepler)
1637	The agens and passum forces. (G. B. Balani)
1678	**Light** as a "*corpuscle*" (I. Newton) and **as wave** (Ch. Huygens).
1687	Principia: **Space, time and mass m** $d\mathbf{F}=d(m\mathbf{v})$**;** Lex Secunda**. The law of gravitational force.** (I. Newton) "*The constant G is understood under the condition of equality of inertial mass* m^I *and gravitational mass* m^G."
1736-	Development of analytical mechanics. "*The canonical coordinates are determinable; the masses are unchangeable; moving bodies do not radiate in fields; the energy conservation of bodies."* Extremal and **variation principles**. (L. Euler, P. L. M de Maupertuis, J. Le Rond d'Alambert,
1800	J. L. de Lagrange, W. R. Hamilton, P. S. de Laplace, C. G. J. Jacobi)
1811	**Hypotheses of atoms** (J. Dalton) and **molecules** (A. Avogadro). Universal thermo-state-equation of ideal gases. (J. L. Gay-Lussac)
1820	**Magnetic force of currents**. (J. B. Biot, S. Savart, P. S. Laplace)
1826	Ohm's law of electric currents. (G. S. Ohm) **Non-mechanical systems have to be treated such exactly as mechanical systems**. (J. B. Fourier)
1832	**Mathematics of continuous systems.** Magnetic units. (C. F. Gauss)
1933	Chemical equivalence of the same charge amount. (M. Faraday)

Year	Experimental Results	Year	Technical Advantages	Year	Theoretical Mile Stones
	Electrolyse (M. Faraday)		Begin of industrial revolution.	1836	**Eikonal theory of waves: The relation of the wavelength to the size of objects determines the wave or corpuscle character of light.** (W. R. Hamilton)
1841	Acceptance of Ohm's law (G.S. Ohm)	1839	Photography. (R. L. M. Daguerre)		
1842	Doppler effect of light. (Ch. Doppler)			1842	**Generalized energy conservation**. (J. R. Mayer, K. P. Joule)
1850	Foucault's pendulum experiment. (J. B. L. Foucault)			1850	Mathematics of e.m. field. (L. Euler, D. Poisson, C.F. Gauss, G.G. Stokes)
				1854	Mercury's perihelion rotation: 43" per century. (U. J.J. Le Verrier)
				1859	**Universal radiation at temperature equilibrium**. (G. Kirchhoff)
		1860	Spectral analysis. (R. W. Bunsen)	1860	Universal distribution of velocity in gases. (J. C. Maxwell)
		1863	Ammoniac synthesis. (E. Solvay)		**Space geometry manifolds and differential metric.** (G.F.B. Riemann)
1865	First estimation of atom size, ~10^{-7} cm and number of atoms in one mol, L~10^{26}. (J. Loschmidt)	1864	Nitro-glycerine. (A. Nobel)	1865	**Electromagnetism and light is unified** in the same theory.
1876	Discrepancy of specific heats of gases.			1869	The period system of elements. (D. Mendelejeff) The connection of **space geometry manifolds and interacting forces**. (G.F.B. Riemann)
1879	**Temperature dependence of radiation**. (J. Stefan)	1879	**Fourth state of matter** = 'plasma'. (W. Crookes)	1880	Relativity of motions postulated (E. Mach)
1881	**c**-experiment of A. A. Michelson and E. W. Morley. International units for electromagnetism.			1881	**The Maxwell Equations of Electrodynamics.** (J. C. Maxwell) The radiation of moving electric charges; the Lorentz force in the e.m. field. (H. A. Lorentz) **Atomic theory and electricity**. (H. v. Helmholz)
1884	Spectral distribution of e.m. radiation.			1884	Emissivity of black body from thermodynamics and Maxwell-Eqs. (L. Bolzmann) **Energy law in e.m. field and electric charged bodies**. (O. Heaviside, J. H. Poynting)
1885	First rule of atomic spectra. (J. J. Balmer)				
		1888	Electric dipole radiation. (H. Hertz)		
1889	Torsion Balance experiment: **The gravitational force is the same for different materials**. (L. von Eötvös)			1893	**T dependence of e.m. radiation density at equilibrium**. (W. Wien)
1895	Discovery of X-Rays. (W. C. Röntgen)			1895	Thermodynamic of chemical reactions essentially completed. Absolute temperature T, fundamental constant **k**=n**R,** entropy *S*. (H. v. Helmholz, J. P. Joule, R. Clausius, L. Boltzmann, J. W. Gibbs)
1896	Discovery of the radioactivity. (A. H. Becquerel; M. Curie)				

Year	Experimental Results
1897	Discovery of charged **electron** (e) and the estimation of $\boldsymbol{q}/\mathbf{m}_e$. (J. J. Thomson)
	The split of spectral lines. (P. Zeeman)
1900	$\boldsymbol{h}$=6.55x10^{-27} erg s, **k**=1,38x10^{-16} erg/K
1903	**The photoelectric effect**. (F. Lénard)
1905	First systematic of **spectral lines**. (J. J. Balmer, W. Ritz)
1910	Measurement of **elementary electric charge e.** (R. A. Milliken)
1911	Discovery of **nuclei**. (E. Rutherford)
1912	Discovery of cosmic rays. (V. F. Hess)
1914	**Experiment of J. Frank and G. Hertz.**
1915	**Alfa, beta and gamma decays of nuclei.** (E. Rutherford)
1919	Discovery of **proton** (P) with the **mass** $\mathbf{m}_P$ **.** Eddington's "*expedition for the* GRT".

Year	Technical Advantages
1898	Liquefaction of H_2.
1899	Roentgen apparatus.
1908	Liquefaction of He.
1913	Geiger counter. (H. Geiger)
1919	Alfa particle scattering on N nuclei (E. Rutherford)

Year	Theoretical Mile Stones
1897	**The producer of spectral lines are particles with the same** $\boldsymbol{q}/\mathbf{m}_e$ **as the particles in cathode rays.** (H. A. Lorentz)
1898	Chemistry do not have a unified picture of atoms and molecules. In physics the atom hypothesis is disputed. (L Boltzmann contra W. Ostwald)
1900	M. Planck's radiation formula with a fundamental constant $\boldsymbol{h}$. "*Interpretation of* $\boldsymbol{h\upsilon}$ *as energy quantum of harmonic oscillator*".
1904	**Covariant electrodynamics. The electric charge is invariant and is conserved**. Lorentz transformation. (H. A. Lorentz, H. Poincaré))
1905	The special relativity. (Lorentz, Einstein, Poincaré) *"Photon hypothesis = the quantization of the energy with* $\boldsymbol{h\upsilon}$ *".* "*The mass-energy equivalence principle* $E = m\boldsymbol{c}^2$." (A. Einstein)
1907	*"Equivalence of inertial and gravitational mass and the constant* G = *the Weak Equivalence Principle* (WEP)." > "*A base of geometrized gravity."* (A. Einstein)
1908	**The four dimensional world.** (H. Minkowski)
1910	**Introduction of isotopes**. (F. Soddy)
1911	$\boldsymbol{q}$, $\mathbf{m}_e$ and $\boldsymbol{h}$ determine the atom size. (A. Sommerfeld) Discovery of supra conductivity with $\boldsymbol{B}$=0. (H. Kamerlingh-Omnes)
1913	The $\boldsymbol{h}$ and the atom: "*Bohr's atom model*." (N. Bohr)
1915	"*Field equations of the General Relativity Theory* (GRT)." (A. Einstein)
1916	"*Black hole singularities*." (K. Schwarzschild)
1918	**Invariant variation problems**, **Noether theorem**. (E. Noether)

Year	Experimental Results
1920	Discovery of the galaxies. (E. Hubble) **Proton = nucleon of hydrogen.** (E. Rutherford)
1922	„*The Compton effect*". (A. H. Compton) Torsion balance: "$m^I = m^G$" with ~10^{-9} accuracy". (Eötvös)
1926	"*Hypothesis for spectral lines:* the *spin 1/2 of electron".* (G. E. Uhlenbeck, S. Goudsmit)
1929	The word 'plasma' used firstly by I. Langmuir.
1930	"*The Universe expands isotropic*." $G\mu T^2 \sim 1$, μ=averaged mass density in the Universe, $\mu = 10^{-29}$ g/cm2, $T = 10^{10}$ year. (E. Hubble)
1932	Discovery of the **positron** (p) with the **mass** $\mathbf{m}_e$ (C. D. Andersen) and of the neutron. (J. Chadwick) "*Neutron is an elementary particle*."
1937	Investigations of cosmic rays (**protons and nuclei**).
1938	Discovery of nuclear fission. (O. Hahn, F. Strassman) "*Discovery of Myon particles*". (S. H. Neddermeyer, C. D. Anderson)

Year	Technical Advantages
1920	Mass spectrometers. (F. C. Aston)
1921	Supra fluidity of He. Diverse counters for charged particles and gamma rays.
1913	Geiger- Müller counter.
1930	First cyclotron. (E. O. Lawrence)
1931	Electron microscope.
1940	First computer. (J. Neumann)
1942	First nuclear reactor. (E. Fermi,

Year	Theoretical Mile Stones
1920	***h*** is mysterious and has an increasing importance. (M. Born) **"*h* *is interpreted* as *quantum of action."***
1921	Bohr's intuitive theory of periodical system of chemical elements.
1924	***h*** is responsible for the "*dualism of particle and wave*". (L. de Broglie)
1926	Wave equation of H-atom for "*energy quantization*". (E. Schrödinger) Formulation of Quantum Mechanics. The "*universality* of ***h*"** is accepted.
1927	Hypothesis: *"The uncertainty principle with* ***h*"**. (W. Heisenberg)
1928	The begin of Quantum-Electro-Dynamics (QED). The "*second quantization*" of fields and mass particles. The "*universality of* ***h,*** *the energy-mass-equivalence, creation and annihilation of particles, closed systems and the quantization of energy*" are accepted. (P. Jordan, P.A.M. Dirac, W. Pauli)
1931	Hypothesis of mass-less **neutrino** for beta decay of nuclei. (W. Pauli)
1932	"*Two states of nucleon proposed: proton and neutron*." (W. Heisenberg)
1933	Begin of theoretical nuclear physics. "*The theory of beta decay*". (E. Fermi) Nuclear force: **short ranged, in small distance repulsive, saturation.**
1935	Explanation of the unknown nuclear forces between proton and neutron through the hypothesis of *"particle creation and annihilation"*. (H. Yukawa) "*Each particle has its own antiparticle*". (W. Heisenberg, P. A. M. Dirac)
1936	Dispersion theory of nuclear reactions. (J. Wigner, G. Breit)
1938	*"The solar energy cycle*." (4 protons in He-nucleus). (H. A. Bethe) "*There are four fundamental interactions assumed*" beside the macroscopically known gravitational and electromagnetic interactions.

Year	Experimental Results
1947	"*Discovery of the Pion particles*". (C. F. Powell)
	"*Discovery of the Kaon particles*". (G. D. Rochester)
	Distinction between Myons and Pions.
	Exact measurement of the Lamb shift. (W. Lamb)
1948	Magic numbers of nuclei 2, 8, 20, 40, 50, 82, 126 (M. Goeppert-Mayer, H. Jensen)
1955	**Discovery of the negative charged antiproton = elton** (E) **with the mass m** $_P$. (E. G. Segré)
	First detection of neutrinos. (F. Reines, G. A. Cowan)
1958	**Mössbauer effect**. (R. L. Mössbauer)
1960	**All isotope masses m** ^{I} are measured. (Tables of Nuclear Phys., J. Mattauch)
1961	IUPAC: Atomic weights with C12 isotope.
	First estimation of proton, neutrino cross section: 0.11×10^{-42} cm^2. But, what are the neutrinos? What are their properties? How many different neutrinos exist ?
1972	Torsion Balance "$m^I = m^G$ with 10^{-12} accuracy". (V. Braginsky) Laser hologram. (G. Dénes)
1974	SLAC: New particle at 3 GeV, "*charmed quarks*".
1975	Plasma experiments in IPP Garching/Germany.
1976	Always more "*unstable particles*" are seen.

Year	Technical Advantages
1945	L. Szilard). The atom bombe.
1948	First transistor. (W. H. Brattain)
1949	Semiconductor detectors. (K.G. MacKay)
1955	6 GeV accelerator in Berkeley.
1956	Technical supra conductors. (S. C. Collins) Neutrino detectors.
1959	Technical amounts of Be produced.
1963	Integrated electric circuits.
1967	Proportional counters. (G. Charpak et al.)
1970	Particle storage circuits.

Year	Theoretical Mile Stones
	Two further microscopic interactions:" *the weak and the strong interactions*". The reasons of the microscopic interactions are unknown.
1947	"*The theory of Big Bang*". (G. Gamow) Discovery of Hyperons in cosmic rays. (G. D. Rochester, C. Ch. Butler)
1948	"*Quantum-Electrodynamics* (*QED*)". (J. Schwinger, R. P. Feynman, F. J. Dyson, S. I. Tomonaga)
1950	"*The conversion of neutral Pion in two gamma quanta*". (D. E. Carlson) High energy physics: "*elementary particles change*".
1956	"*Theory of parity violation*". (T. D. Lee, C. N. Yang) Because of **lack of a microscopic valid Lagrange function for particle dynamics**, "*a model for the strong interaction is proposed*". (S. Sakata) The usage of "*isospin, strangeness etc.*" is an expression of physical unknowledge.
1961-1964	SU(3) symmetry group, "*the hypothesis of intrinsic symmetry of particles*". "*The hypothesis of quarks*": (M. Gell-Mann, G. Zweig)
1967	A comparison of the SU(3) model with experiments: It offered several **inadequate** and **unphysical assumptions**. (Gy. I. Szász)
1968	**The begin of a consistent description of unstable particles and microscopic resonances** at the University of Mainz. (Gy. I. Szász)
1973	"*A trial of Great Unified Theory*". (H. Georgi, S. Glashow)
1974	Microscopic resonance phenomenon and unstable particles described with a **variation principle of open particle systems**. (Szász)
1976	The years of development in "*Quantum-Chromo-Dynamics* (QCD)". Always more new "*intrinsic quantum numbers of quarks*" are needed.

Year	Experimental Results	Year	Technical Advantages	Year	Theoretical Mile Stones
1977	L. Lederman: "*New quantum number for quarks*". Existence of a 80 GeV "*boson*"?	1977	500 GeV accelerator at CERN. New neutrino-detectors.	1977	[Eikonal theory **excludes** the existence of photons at radiation of bound particles. The Planck's constant ***h* is not universal**. The four stable particles (e, p, P, E) **do not have** intrinsic angular momenta. The canonical coordinates of particles **are principally undeterminable. Two types of elementary charges** (electric and gravitational charge) exist of the four **Elementary Particle**. Do the (e,P) and (p,E) systems radiate always? Therefore, **the particles energy is not conserved** in these bound states? The (e,p) and (P,E) systems have **stable bound ground states** in which both net charges are zero: **Two types of neutrinos exist**. (Unpublished investigations by Szász)]
1983	"*Discovery of heavy bosons*". (C. Rubbia)	1979	30 GeV electron + positron energy at DESY. (Cosmic rays have up to 10^{11} GeV energy.)		
1987	**Explosion of the star SN1987A** observed. Nearly 200 "*unstable particles*" are known.				
1989	Palladium catalyst causes heat from electrons and Deuterons. (M. Fleischmann, S. Pons)	1990	New Hubble telescope. Radioactive particle accelerators.		
1996	**Back ground radiation** at 2.728 K. (J. Mather) **The time dependency of** G. (O. V. Karagioz)	1997	Investments of 10 milliard dollar for high energy accelerators!	1997	The planet and exoplanet orbits are not arbitrary and **fulfil** a Schrödinger like equation. (L. Nottale and others) For discrepancies in gravity a "*fifth fundamental force*" is sought by the Eöt-Wash Group/Seattle and others.
1999	Torsion balance: "$m^I = m^G$ with $5x10^{-13}$." (S. Baeßler)				
2000	**The uncertainty of the Newtonian constant** G **was set up by a factor of twelve** (CODATA): $G = 6{,}673(10)x10^{-11}\ m^3\ kg^{-1}\ s^{-2}$. Measurement of G with 14 ppm. (J. H. Gundlach) **Upper limit of neutrino mass:** 2.2 eV. (E. W. Otten)			2001	**Hypothesis (Szász): Only four Elementary Particles (EP) with two types of charges exist: electron, positron, proton and elton. The four EP are else**
				2002	**point-like and structure-less. The elementary gravitational charges are $g_1 = -gm_e$, $g_2 = +gm_e$, $g_3 = +gm_P$ and $g_4 = -gm_P$. The numerical value of the gravitational constant is $G=g^2/4\pi = 6{,}576(6)x10^{-11}\ m^3\ kg^{-1}\ s^{-2}$.**
2004	**Experimental verification of the composition dependent UFF violation in Bremen.** (Szász) **$m^I = m^G$ (1 – delta), with delta in the range of pro mille. Delta follows from the mass defect of isotopes, but at the experimental verification two types of elementary charges have to be included.**	.		2003	**Field equation for the non-conservative gravity $\partial_\alpha \partial^\alpha A^{(g)\beta} = -j^{(g)\beta}$ with $\partial_\beta j^{(g)\beta} = 0$ and $\partial_\beta A^{(g)\beta} = 0$. The sources of the gravitational field is quantized with superposition rule for g-charges. The gravitational charges are invariant Maxwell charges. Unified Field Theory for electromagnetism and gravity with the four EP. Principles for a New Model of physics of elementary processes.**