At the International Congress of Mathematicians at Paris in 1900 David Hilbert delivered a lecture about 23 fundamental problems in both physics and mathematics that weren't solved at that time.

Up to this day David Hilbert's 6th problem isn't solved.
(The original text can be found at:
http://quantumuniverse.eu/Tom/Hilberts%2023%20Mathematische%20Probleme.pdf)
Translated in English (http://aleph0.clarku.edu/~djoyce/hilbert/problems.html) it reads:

6. Mathematical treatment of the axioms of physics

The investigations on the foundations of geometry suggest the problem:

To treat in the same manner, by means of axioms, those physical sciences in which mathematics plays an important part, in the first rank are the theory of probabilities and mechanics.

As to the axioms of the theory of probabilities, it seems to me desirable that their logical investigation should be accompanied by a rigorous and satisfactory development of the method of mean values in mathematical physics, and in particular in the kinetic theory of gases.

Important investigations by physicists on the foundations of mechanics are at hand; I refer to the writings of Mach, Hertz, Boltzmann and P. Volkmann (Einführung in das Studium der theoretischen Physik, Leipzig 1900). It is therefore very desirable that the discussion of the foundations of mechanics be taken up by mathematicians also. Thus Boltzmann's work on the principles of mechanics suggests the problem of developing mathematically the limiting processes, there merely indicated, which lead from the atomistic view to the laws of motion of continua. Conversely one might try to derive the laws of the motion of rigid bodies by a limiting process from a system of axioms depending upon the idea of continuously varying conditions of a material filling all space continuously, these conditions being defined by parameters.
For the question as to the equivalence of different systems of axioms is always of great theoretical interest.

If geometry is to serve as a model for the treatment of physical axioms, we shall try first by a small number of axioms to include as large a class as possible of physical phenomena, and then by adjoining new axioms to arrive gradually at the more special theories. At the same time Lie's principle of subdivision can perhaps be derived from a profound theory of infinite transformation groups. The mathematician will have also to take account not only of those theories coming near to reality, but also, as in geometry, of all logically possible theories. He must be always alert to obtain a complete survey of all conclusions derivable from the system of axioms assumed.

Further, the mathematician has the duty to test exactly in each instance whether the new axioms are compatible with the previous ones. The physicist, as his theories develop, often finds himself forced by the results of his experiments to make new hypotheses, while he depends, with respect to the compatibility of the new hypotheses with the old axioms, solely upon these experiments or upon a certain physical intuition, a practice which in the rigorously logical building up of a theory is not admissible. The desired proof of the compatibility of all assumptions seems to me also of importance, because the effort to obtain such proof always forces us most effectual to an exact formulation of the axioms.

End of David Hilbert's translated sixth problem.

All explanations of used concepts in physics will be based on Wikipedia's information on these concepts.

First some insight in the concept "*geometry*": http://en.wikipedia.org/wiki/Geometry .
Geometry is a part of mathematics concerned with questions of size, shape, and relative position of figures and with properties of space. Geometry is one of the oldest sciences. Initially a body of practical knowledge concerning lengths, areas, and volumes, in the third century BC geometry was put into an axiomatic form by Euclid, - whose treatment - set a standard for many centuries to follow. The field of astronomy, especially mapping the positions of the stars and planets on the celestial sphere, served as an important source of geometric problems during the next one and a half millennium. A mathematician who works in the field of geometry is called a geometer.

Introduction of coordinates by Descartes and the concurrent development of Algebra marked a new stage for geometry, since geometric figures, such as plane curves, could now be represented analytically, i.e., with functions and equations. This played a key role in the emergence of Calculus in the 17th century. Furthermore, the theory of perspective showed that there is more to geometry than just the metric properties of figures. The subject of geometry was further enriched by the study of intrinsic structure of geometric objects that originated with Leonard Euler and Carl Friedrich Gauss and led to the creation of Topology and Differential geometry.
Since the 19th century discovery of Non-Euclidean geometry, the concept of space has undergone a radical transformation. Contemporary geometry considers manifolds, spaces that are considerably more abstract than the familiar Euclidean space, , which they only approximately resemble at small scales. These spaces may be endowed with additional structure, allowing one to speak about length.
Modern geometry has multiple strong bonds with physics, exemplified by the ties between Riemannian geometry and General Relativity. One of the youngest physical theories, String theory, is also very geometric in flavor.

The visual nature of geometry makes it initially more accessible than other parts of mathematics, such as algebra or number-theory. However, the geometric language is also used in contexts that are far removed from its traditional, Euclidean provenance, for example, in fractal geometry, and especially in Algebraic geometry.

All so-called elementary particles, together with all their characteristics can be derived from a complete non-reducible geometric symmetry analysis of 4D-space-time. I.e. the only space-time that can be used to describe mathematical knots. This fact proofs David Hilbert's wish as described as his 6th problem.

The proof of David Hilbert's problem 6 will be given below:

In the summer of 2003 Grigori Perelman proved that the only mathematical space in which knots are possible is Einstein's S(pecial)R(elativistic) 4D-space-time.

In his papers 0211159v1.pdf, 0303109v1.pdf and 0307245v1.pdf G. Perelman shows that knots are only possible in 3D-space, i.e. the easy imaginable SR 4D-spacetime. In smaller dimensional spaces knots are not possible as anyone can imagine straight away. In higher dimensional spaces knots are again not possible due to symmetry demands of such spaces. This is the main reason why all SuperString theories will proof incorrect within the coming years as the LHC not only tries to verify experimentally the existence of the elementary spinless Higgs-boson, but also tries to detect the lightest so-called SuperPartner. A simple mathematical explanation of problem 6 of David Hilbert will also show that both the Higgs-mechanism and SuperString theories do not describe our reality on a deeper level.

G(eneral)R(elativistic) space-time is curved. This curved space-time can be analyzed mathematically, i.e. linear, when the amount of degrees of freedom is doubled as explained in Curvature and QM. Einstein solved curvature mathematically in a (linear) so-called Riemann-space. Mathematical analysis is only possible in a linear space specified with rectilinear axes. Curvature is due to in-homogeneous distribution of mass and mass-speed in any possible universe. The only way to solve this characteristic mathematically is describing all elementary particles extended in the 2D-plane orthogonal to the (described) direction of motion (SR-worldline). The movement of the mathematical point in this plane must oscillate harmonically because all so-called particles (building blocks of nature) possess energy proportional to a detected frequency. Einstein proved this for the spin1 photon and Louis-Victor de Broglie proved this fact for all fermions. The time-like conserved energy has to be described as the constant Hamiltonian:

$$H = hf = E(\mathbf{p}) + U(\rho) \qquad (1)$$

All bold symbols specify space-like 3D-vectors.
This Hamiltonian is described with respect to the inertial frame moving with the harmonic oscillating particle and with origin at the average position of the oscillating point, i.e. at the position on the SR-worldline at which the particle is described in the standard **Q**(uantum) **F**(ield) **T**(heories).

With h Planck's constant, f the frequency of oscillation in this 2D-plane orthogonal to the direction of motion, $E(\mathbf{p})$ the kinetic energy which depends on the momentum **p**, rest-mass m_0 and $U(\rho)$ the potential energy, which must enforce harmonic oscillation:

$$E(\mathbf{p}) = \sqrt{(m_0^2c^4+\mathbf{p}^2c^2)} \wedge U(\rho \equiv |\boldsymbol{\rho}|) = ½k\rho^2 \qquad (2)$$

With m_0 the rest-mass of the elementary particle, ρ the polar distance of the harmonic oscillating point with respect to the worldline in the 2D-plane orthogonal to this worldline and k a force-constant of an harmonic oscillation inducing force: $\mathbf{F} = -k\boldsymbol{\rho}$ (3)
Here **ρ** is the polar vector in the 2D-plane from the origin of the inertial frame moving with the oscillating point-particle at the position of the elementary particle as described in all **QFT**.
The space-like constant of motion just is the so-called intrinsic angular momentum, usually called the spin, or more correctly the helicity, i.e. spin in the direction of motion of the particle. In all SR **QFT** not spin as such is a conserved quantity, only the spin of the particle in the direction of motion is a conserved quantity usually called the "***intrinsic angular momentum***".

All so-called elementary particles with all their characteristics are in fact the non-reducible representations of all geometric possible symmetry groups of the described 4D-spacetime

universe. Where it should be realized that these discrete and continuous symmetries also imply inversion and gauge-symmetries.
The harmonic oscillating motion in the 2D-plane orthogonal to the (observed) direction of motion implies an average extendedness of the described elementary particle. The average extendedness is equal to: $2\langle\rho\rangle = \rho_{max} + \rho_{min} = 1½ \rho_{min}$ (4)
This extendedness is proportional to the spin s of the described elementary particle in compliance with the C(omprehensive) A(ction) P(rinciple).
Paul Dirac already concluded in 1929 that spin is a necessary characteristic of electrons when combining QM and SR. In 1921 Albert Einstein showed that any physical description must include the gravitational action, i.e. include curvature of space-time, in short comply with the CAP.
A CAP complying description of any possible elementary particle shows that CAP complying elementary particles always possess spin > 0. I.e. a spinless elementary particle does not comply with the CAP, so can ***NOT*** exist in real life! Up to this day no elementary spinless particle has ever been observed experimentally.
This fact can be imagined quite easily. A mathematical point moving along a 1D-worldline is not able to oscillate harmonically, so can't carry energy proportion to a frequency.
In all **QFT** elementary particles are described as point-particles, which move along their worldlines. All characteristics of elementary particles are described with so-called state-functions. The statefunction is solved using an Euler-Lagrange equation and solving the stationary action of Hamilton's principle. In **QFT** all that's possible to deduce from an analyzed system can be deduced from the resulting state-function following from the Lagrangian density. In **QFT** this function is expressed in second quantization, i.e. using creation and annihilation operators. In all used **QFT** the state-functions are exact mathematical point-equations. As a result the used state-functions of **QFT** do not comply with the CAP. All so-called characteristics of all described elementary particles are derived from the state-function. I.e. the spin is assumed to follow from the angular-momentum of the state-function integrated over all space where the state-function cannot be assumed zero. However, angular-momentum is a conserved quantity and this fact is also included in the complex state-function in Hilbert space. It's quite easy to derive that a state-function of a spinless elementary particle can only be non-zero on the 1D-worldline, i.e. using a non-CAP compliant description.
However, it is easy to rewrite **QFT** such that they comply with the CAP: Describe elementary particles as harmonic oscillating mathematical points in the 2D-plane orthogonal to the observed direction of motion (SR-worldline).

But first all possible elementary particles of any possible, i.e. 4D-space-time universe, will be derived from a complete, but non-reducible, geodesic symmetry analysis:

First of all it will as a simple start be assumed that space-time is 4Dimensional. Later it will be proven that other dimensional space-times cannot describe any valid reality.
In this case all possible infinitesimal (i.e. linear SR) transformations of a 4-vector can be given by a 4 x 4 = 16 independent degrees of freedom transformation matrix. The transformation matrix must be a tensor to yield (relativistic) transformation invariant expressions. This tensor can be uniquely given as the sum of a symmetrical tensor $S_{\mu\nu}$ and an anti-symmetrical tensor $A_{\mu\nu}$:

$$T_{\mu\nu} = S_{\mu\nu} + A_{\mu\nu}, \text{ with: Symmetrical: } S_{\mu\nu} = S_{\nu\mu} \wedge \text{ Anti-Symmetrical: } A_{\mu\nu} = -A_{\nu\mu} \qquad (5)$$

All possible infinitesimal transformations of a 4-vector are included in (5).

The symmetrical transformation tensor $S_{\mu\nu}$ can 1-to-1 be represented by spin½ ⊗ spin2. The spin½ represents the massive stable elementary and compound particles, which are the sources of the spin2 gravitational field.
The anti-symmetrical transformation tensor $A_{\mu\nu}$ can 1-to-1 be represented by spin½ ⊗ spin1. The spin½ now represents the electrically charged stable elementary and compound particles, which are the sources of the spin1 EM-field.
So, all possible transformations of a 4-vector can also be represented mathematically by the following stable particles of any possible, i.e. 4D-spacetime universe:

$$\text{spin}\tfrac{1}{2} \otimes \text{spin2} \oplus \text{spin}\tfrac{1}{2} \otimes \text{spin1} \qquad (6)$$

As is well known, the EM-field is only specified completely after implying the Lorentz U(1)-gauge symmetry. In a 4D-space-time universe, the complete non-reducible gauge symmetry is just the used gauge-symmetry of the **S(tandard)M(odel)**:

U(1) x SU(2) x SU(3), the Complete-Non-Reducible gauge-symmetry. (7)

The U(1) x SU(2) gauge symmetry describes mixed by the Weinberg angle θ_w the EM-field (the photon) and the weak nuclear forces (the three massive $\{W^{\pm}, Z\}$ IVB), which must all be massive spin1 bosons.
All charged particles are massive, so all bosons of the weak nuclear forces are massive.
The SU(3) gauge symmetry describes all quarks as spin1½ fermions without so-called iso-spin½. A simple complete non-reducible gauge-symmetry analysis implies that quarks are spin1½ fermions to represent the SU(3) gauge-symmetry 1-to-1. As a result all possible spins, possible in a 4D-spacetime universe, i.e. $s \in \{½, 1, 1½, 2\}$, are the building-blocks of the only possible constituents in real life.
The quarks are the unstable spin1½ constituents of the compound fermions called baryons, and the compound bosons, called mesons and gluons which keep the three quarks of a baryon together in a stable compound spin½ fermion. The only possible (i.e. intrinsic-) stable spins are given by representation (6): $s \in \{½, 1, 2\}$ (8)

The only still possible particles in any valid 4D-universe, deduced from (6), are the stable elementary spin½ fermions, called the leptons.
The basic electric charge of an elementary particle is equal to the electron charge, usually defined as electron charge -e. Any acceptable model of any possible universe, i.e. our reality, must be non-reducible. As a result of this fact and the mathematical fact that the symmetrical and anti-symmetrical actions are orthogonal implies that there is only one possible stable elementary charge, which in our universe is the so-called electron charge. Even though the CAP still has to be taken into account! All particles have so-called anti-particles, with the same characteristics except for an opposite charge. All stable baryons also have charges in stable integer values of electron charge {-e, 0, e}. The quarks themselves have charges of ±⅓e and ±⅔e, but aren't stable particles on their own and always surrounded by a so-called gluon sea (2 quarks connected into a boson) that describes the strong nuclear force.
In the **SM**, quarks are assumed to be spin½ fermions with additional so-called isospin. However, this description does not explain why quarks cannot be observed on their own, while spin½ combined with also dual isospin ½ does not follow from a complete non-reducible symmetries analysis.

The 2D-extendedness in the 2D-plane orthogonal to the observed direction of motion (worldline) must be described mathematical, i.e. infinitesimal linear, with the following D(ifferential)E(quation)'s:

$$\boldsymbol{\rho}^{-1} = \frac{\dot{\mathbf{p}}}{E} \qquad (9)$$

Here **ρ** is the polar vector in the 2D-plane and the 'dot' stands for differentiation with respect to the proper time in the inertial frame with origin moving with the average position of the particle, chosen as the z-axis.

$$\dot{\mathbf{p}} = \mathbf{F}(\rho \equiv |\boldsymbol{\rho}|) \qquad (10)$$

$$\dot{\mathbf{p}} \cdot \boldsymbol{\rho} = \dot{\mathbf{p}} \cdot \dot{\mathbf{p}} = 0, \text{ the required harmonic demand.} \qquad (11)$$

Force (3) is conservative and can be related to a potential energy: $\mathbf{F} = -\nabla U(\rho)$ (12)

From (9), (10), (2) and (12) one also deduces:

$$\dot{E} = -\dot{\boldsymbol{\rho}} \nabla U(\rho), \qquad (13)$$

, which implies conservation of total energy (1).

Differentiating (9), using (10), (13) and (1) yields a 2nd order DE:

$$(H-U)\ddot{\boldsymbol{\rho}} + \nabla U(\rho) - \dot{\boldsymbol{\rho}}\,(\dot{\boldsymbol{\rho}}.\nabla U(\rho)) = 0 \qquad (14)$$

A central conservative force (3) implies a conserved angular momentum (helicity) of the CAP described extended elementary particle:

$$\mathbf{S} = \boldsymbol{\rho} \times \mathbf{p} = (H-U(\rho))\boldsymbol{\rho} \times \dot{\boldsymbol{\rho}} \qquad (15)$$

In which the usually used symbol **L** of the orbital angular momentum is denoted as the so-called intrinsic angular momentum **S** (conserved helicity) to yield a QM description in compliance with the CAP. I.e. QM in compliance with the CAP explains spin completely on a classical level.

In polar coordinates (ρ, φ, z) the DE's to be solved are completely integrable as long as one solves for the square $x \equiv \rho^2$.

Using $S = |\mathbf{S}| \wedge U' = \frac{\partial U}{\partial \rho}$, the DE's read:

$$\ddot{\rho} + \frac{U'}{(H-U)}(c^2 - \dot{\rho}^2) - \frac{(c^2S)^2}{(H-U)^2\rho^3} = 0 \qquad (16)$$

├Set I

$$\dot{\varphi} = \frac{c^2 S}{(H-U)\rho^2} \quad \wedge \quad z = z' = 0 \qquad (17)$$

Call equations (16) and (17) set I, i.e. the set of equations of motion described from the inertial frame with origin at the average position (the position of the elementary particle assumed in all **QFT**) of the particle and with the z-axis chosen in the direction of motion. Set I is the starting point of the equations of motion of all possible geometric symmetry relations induced elementary particles.
In the case **QFT** theories are rewritten in compliance with the CAP, the spin is explained completely at classical level.

DE's (14) and (16) are second order proper time derivatives and require 2 B(oundary) C(onditions) to be solved. The used BC are either open or closed. Closed BC only allow interaction of the 2D-extended elementary particles in the direction of motion, i.e. the SR-worldline. This type of solution explains all characteristics of so-called bosons. Such particles are allowed to be at the same space-time location with all quantum numbers in the same eigen-state. Also, of bosons only one type or so-called "family" exists of all possible infinitesimal relativistic symmetry groups. Likewise, all fermions must be described at infinitesimal level with open BC. Open BC have one positive integer degree of freedom extra. This degree of freedom represents the particle family. The higher this number the more interaction with the gravitational spin2 field, so the higher the mass. Open BC allow interactions of such particles in all space-like directions. As a direct result fermions comply to Pauli's exclusion principle.

Using $x = \rho^2$, DE (16) can be written as:

$$\ddot{x} = \tfrac{1}{2}\left(\frac{k}{(H - \tfrac{1}{2}kx)} + \frac{1}{x}\right)\dot{x}^2 - \frac{2kc^2}{(H - \tfrac{1}{2}kx)}x + 2\frac{(c^2S)^2}{x(H - \tfrac{1}{2}kx)^2} \qquad (18)$$

And the DE of polar angle (17) is already written with $x = \rho^2$ as it is given in (17).
DE (18) written out explicitly using (2):

$$(H-U)^2 x\ddot{x} = \tfrac{1}{2}(H-U)(H+U)\dot{x}^2 - 4c^2(H-U)U\cdot x + 2(c^2S)^2 \qquad (19)$$

Where it should be realized that (H-U) just is the extended particle's kinetic energy centered at the particle's exact (oscillating) point-like position in the 2D-plane orthogonal to the SR-worldline. And this 2nd order DE can be solved exactly, because all powers in x^n are: $n \leq 4$. This is not true for the polar distance ρ, but $\rho > 0$, so can be solved completely with the solution of DE (18) after suitable BC are chosen for the specific elementary particle (boson closed BC, fermion open BC).

In the case of a massless particle one has the constant velocity: $|\dot{\boldsymbol{\rho}}|^2 = \dot{\rho}^2 + \rho^2\dot{\varphi}^2 = c^2$ (20)
This makes the equations of motion of the two massless elementary Bose-particles (spin2 graviton and spin1 photon) relatively easy.
But solutions of these force-particles only make sense after solutions of interacting fermions are known.

This complete 4D-space-time symmetry analysis implies the following elementary particles in any possible universe:

Table 1. All possible elementary particles and their observable forms.

Fermions: *3 different families*	**Bosons:** *The elementary spin1 and spin2 bosons, see (26), and the U(1) x SU(2) x SU(3) gauge-bosons:*
leptons: electron, muon and tauon + anti-particles	graviton, a spin2 elementary massless boson
leptons: massive but chargeless neutrino's	photon, a spin1 elementary massless boson
quarks 1st family: up-quark and down-quark	weak-nuclear forces: spin1 elementary massive gauge-bosons $W^{\pm}$, Z
quarks 2nd family: charm-quark and strange-quark	strong-nuclear forces: spin1 colored quark+anti-quark gluons
quarks 3rd family: top-quark and bottom-quark	mesons: all non-gluon bose-quark combinations

All fermions have so-called anti-particles with changed charge sin of charged particles and opposite helicity in case of uncharged particles. All leptons are spin½ particles and all confined quarks are spin1½ particles.

Any fermion must be described with open BC. This implies interactions in all spacelike directions, i.e. at least necessary interaction with the spin2 gravitational field and as a result of that (rest-)mass > 0.
As a result any massive particle always has velocities:

$$\dot{v} < \text{(lightspeed) } c \tag{21}$$

As a result of this fact, a simple SR symmetry analysis allows knots in the path of every free fermion. I.e. mathematical spaces that do not allow knots cannot describe fermions mathematically. Without fermions all sources of bosons, i.e. force-particles, are removed. As a result of this fact, only universes are possible in space-time geometry's which allow knots. Therefore, only 4D-space-time universes are possible! And such universes only allow fermions with spins s ∊ {½, 1½}, of which only s = ½ elementary and compound fermions are possible as stable fermions. The only allowed elementary bosons have spins s ∊ {1, 2}, which just have one type or "family" of boson for each possible different symmetry group. DE (18) and (19) are 2nd order time derivative DE. A set of two consecutive 1st order time derivative DE is much easier to solve. This is why set I will be rewritten into a set of two consecutive 1st order time derivative DE:

The massless case yields an easy to solve 1st order time derivative DE due to the fact that the speed

$v = \sqrt{(\dot{\rho}^2 + \rho^2 \dot{\varphi}^2)}$ = (lightspeed) c is a constant. In this case one has using (17):

$$(\tfrac{1}{2}\dot{x})^2 = xc^2 - \frac{(c^2S)^2}{(H - \tfrac{1}{2}kx)^2} \tag{22}$$

The solution of $x(\tau) = \rho^2(\tau)$ has exact solutions with incomplete elliptic integrals of both the 1st and 2nd kind. The solution of $\varphi(\tau)$ has exact solutions with incomplete elliptic integrals of the 3rd kind.
So all kinds of (incomplete) elliptic integrals appear in the solutions which also require the Golden Ratio $\varphi = \tfrac{1}{2}(\sqrt{5}+1)$ as a proportionality constant in the exact solutions.
The actual solution for any possible elementary particle still depends on whether the described particle is a boson or fermion, on the conserved spin in the direction of motion (i.e. helicity), the rest-mass, the frequency (i.e. total SR energy) and the force-constant "k". The force-constant "k" depends on the intrinsic angular momentum S (15) and the Hamiltonian H (1) and has the same expression for all possible elementary particles.

After all solutions are given, the Feynman-rules of the SM must be rewritten with CAP complying extended elementary particles in the 2D-plane orthogonal to the described direction of motion (SR-worldline). And instead of the Higgs-mechanism to include mass contributions on a re-normalizable manner, the gravitational (spin2) field must be included, described as the CAP complying (only allowed) spin2 elementary boson to describe the always attractive force between elementary and of course also compound masses. The CAP complying description explains why elementary fermions cannot reach one another at zero distance, but always stay apart at distances larger or equal to the Planck length ($l_h = \sqrt{(hG/2\pi c^3)} \approx 1.61625281\ 10^{-35}$ m, with h Planck's constant, G Newton's gravitational constant and c the speed of light in vacuum. Also see: http://en.wikipedia.org/wiki/Planck_length).

When rewriting QFT with CAP complying extended particles one is able to include the gravitational force and write all four different fundamental forces in one Unified Theory. When realizing that any model without the gravitational field, i.e. curvature of space-time, is not correct, as it doesn't comply with the CAP, one should also realize that the most perfect description of physics, i.e. the Standard Model of Quantum Field Theories, does not comply with the CAP. The only way to yield this very successful **SM** correct implies rewriting it in compliance with the CAP. And this implies 2D-extended harmonic oscillating elementary particles in the plane orthogonal to the direction of motion.
The symmetrical gravitational field (the Ricci-tensor is symmetric) has one additional problem. All gravitational effects can't be measured directly by the (i.e. mathematical orthogonal) anti-symmetrical EM-field.
For example, up to today the graviton has never been detected as a force particle directly in any experiment. This is the reason that about 73% of the total mass-energy of our universe is invisible and as a result of that fact called Dark energy. Just like it is extremely difficult to detect uncharged neutrinos! Mostly in measurements neutrinos are assumed as missing energy in collision processes, because they can't be observed by EM-equipment. If my description of **QFT** is correct, all of the not observed mass in our universe consists out of almost massless neutrinos. At first sight neutrons may also seem chargeless, because the net charge is zero. However when realizing the fact that the neutron is a colorless compound particle build from three different charged quarks, the extendedness of all elementary particles implies a small area around the COM position of the neutron that's not chargeless. Due to the low weight of neutrinos, they almost move with the speed of light, so a very homogeneous distribution of dark mass is to be expected in our universe. Where it should be realized that the spin2 gravitational field carries invisible energy, just like the EM-field carries visible energy. As given in table 1 other elementary particles to explain dark matter aren't available, because no more as the particles given in table 1 can be deduced from a non-reducible complete 4D-spacetime geometric symmetries analysis.

This recapitulated description of **QFT** will be tested to the full at the new LHC at CERN near Geneva within the next years 2012 and 2013. I sincerely hope to have finished the complete CAP compliant Feynman rules of **QFT** before the LHC reaches the 1 TeV boundary for Higgs boson production!?!

The elementary spinless Higgs-boson was assumed to have a mass in the range:

$$114.4\ \text{GeV} < m_H < 156\ \text{GeV} \tag{23}$$

The detected Higgs-resonance detected at the LHC, already in 2014, has a mass of about:

$$m_H \approx 125.6\ \text{GeV} \tag{24}$$

I.e. the force-particle assumed to be responsible for non-zero masses of elementary particles appears to have a (rest-)mass almost as heavy as the heaviest discovered elementary particle, the top-quark 172.9±1.5 GeV! The heavier the mass, the shorter the mean-lifetime. The Standard Model predicts the top-quark mean lifetime to be roughly 5×10^{-25} s. This is about 20 times shorter than the timescale for strong interactions and therefore it does not hadronize! As is well known from astro-physics the gravitational force, which attracts masses of planets, travels with the speed-of-light, i.e. is massless. This astro-physical fact contradicts the assumed mass-range (23) completely. This simple fact alone shows that the Higgs-mechanism, even though brightly discovered, cannot be correct! And when realizing that the Higgs-mechanism was developed without understanding the beautiful world of QM, one also at-once understands why this mechanism is still assumed to be correct after more than 50 years.

In my thoughts, this is the century in which all possible Theories Of Everything finally come to life, just by ***understanding***, instead of just "***knowing***", our universe both on microscopic QM-scale and on macroscopic astro-physical-scale!

And to keep everybody positive, remember that our reality can ***only*** be analyzed in simple linear 4D-spacetime! And this is why also the demanded CAP compliance must be described in this simple linear, i.e. mathematical, 4D-spacetime!

Albert Einstein himself assumed that QM could possibly be analyzed logical deterministic with the use of extra so-called "hidden"-degrees of freedom as described in the Einstein-Podolsky-Rosen experiment. However, John Bell showed that all hidden-variable proposals must be in-correct because they shall never be able to explain the non-local behavior of QM.

Besides that, all possible variables to describe our reality in 4D-Spacetime completely, but also non-reducible, at-once explains all possible variables for all possible different elementary-particles completely. As a direct result, we can NOT use "hidden"-variables to explain QM in a more logical manner.

However, when one describes QM in compliance to the CAP, i.e. when describing all elementary-particles as extended harmonic-oscillating entities in the 2D-plane orthogonal to the analyzed direction of motion, the spin2 "***dual***" character comes to life naturally. The mathematical point of the harmonic oscillation cannot be on it's average position "worldline", so interaction must be described as interactions between 3D-harmonic-oscillating waves with either Closed-BC (bosons) or Open-BC (fermions). These mathematical analyses can only be solved in the complex Hilbert-Space of QM and describe the spin and the energy proportional to a frequency explicitly! To me, writing-out elementary-particles as harmonic-oscillating waves in the 2D-plane orthogonal to the analyzed direction of motion, i.e. NOT as "simple point-particles" explains all possible TOE's and at the same time represents Einstein's "hidden"-variables to explain QM completely.

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P.S. To be able to explain QM in person with others ***not*** all results are given here (the massive solutions, force-constant k, etc. ..).