LIGO and Quantum Gravity

Einstein's theory of general relativity predicts that accelerating masses emit gravitational waves. And last week, a century after this prediction was made, the LIGO collaboration announced their first direct detection of gravitational waves. But this was only the beginning – we expect many more events, and these will put Einstein's theory to the test with unprecedented accuracy. What, if anything, does this mean for physicists' efforts to find a theory of quantum gravity – the still missing combination of general relativity with quantum mechanics? [11]

Physicists have searched for a theory of quantum gravity for 80 years. Though gravitons are individually too weak to detect, most physicists believe the particles roam the quantum realm in droves, and that their behavior somehow collectively gives rise to the macroscopic force of gravity, just as light is a macroscopic effect of particles called photons. But every proposed theory of how gravity particles might behave faces the same problem: upon close inspection, it doesn't make mathematical sense. Calculations of graviton interactions might seem to work at first, but when physicists attempt to make them more exact, they yield gibberish — an answer of "infinity." "This is the disease of quantized gravity," Stelle said. [8]

Even if gravitons are there, it's probable that we would never be able to perceive them. Perhaps, assuming they continue inside a robust model of quantum gravity, there may be secondary ways of proving their actuality. [7]

The magnetic induction creates a negative electric field, causing an electromagnetic inertia responsible for the relativistic mass change; it is the mysterious Higgs Field giving mass to the particles. The accelerating electrons explain not only the Maxwell Equations and the Special Relativity, but the Heisenberg Uncertainty Relation, the Wave-Particle Duality and the electron's spin also, building the Bridge between the Classical and Quantum Theories.

The Planck Distribution Law of the electromagnetic oscillators explains the electron/proton mass rate and the Weak and Strong Interactions by the diffraction patterns. The Weak Interaction changes the diffraction patterns by moving the electric charge from one side to the other side of the diffraction pattern, which violates the CP and Time reversal symmetry.

The self maintained electric potential of the accelerating charges equivalent with the General Relativity space-time curvature, and since it is true on the quantum level also, gives the base of the Quantum Gravity.

The diffraction patterns and the locality of the self-maintaining electromagnetic potential explains also the Quantum Entanglement, giving it as a natural part of the relativistic quantum theory.

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Preface

Physicists are continually looking for ways to unify the theory of relativity, which describes large-scale phenomena, with quantum theory, which describes small-scale phenomena. In a new proposed experiment in this area, two toaster-sized "nanosatellites" carrying entangled condensates orbit around the Earth, until one of them moves to a different orbit with different gravitational field strength. As a result of the change in gravity, the entanglement between the condensates is predicted to degrade by up to 20%. Experimentally testing the proposal may be possible in the near future. [5]

Quantum entanglement is a physical phenomenon that occurs when pairs or groups of particles are generated or interact in ways such that the quantum state of each particle cannot be described independently – instead, a quantum state may be given for the system as a whole. [4]

I think that we have a simple bridge between the classical and quantum mechanics by understanding the Heisenberg Uncertainty Relations. It makes clear that the particles are not point like but have a dx and dp uncertainty.

Can LIGO test Quantum Gravity?

General relativity is an unquantized theory, and gravitational waves have been predicted independently of attempts to find a consistent quantized version of gravity.

The existence of gravitational waves thus can be explained without quantum gravity. It is generally expected, however, that quantum gravity gives rise to “gravitons” that are quantized gravitational waves. The graviton is a particle which is related to gravitational waves the same way that a photon is related to electromagnetic waves – the particle is a tiny chunk of the wave with an energy proportional to the wave’s frequency. The properties of the waves themselves in the context of general relativity give us all sorts of useful information about the quantum version of the graviton particle: it must be massless, it must have a spin of 2 (as opposed to 1 for photons, ½ for electrons and 0 for the Higgs boson), and it must propagate at the speed of light.

A gravitational wave consists of a huge number of gravitons, but measuring the individual constituents is extremely difficult and well beyond our experimental capabilities. LIGO doesn’t resolve single gravitons for the same reason a TV antenna doesn’t resolve single photons: if there is a signal, the detector is swamped with particles and not sensitive to the tiny, discrete steps in energy. If gravitons exist, LIGO detects them, but it cannot distinguish the huge amount of gravitons from an unquantized gravitational wave. Therefore, LIGO cannot not tell us anything about the existence of gravitons. [11]

Betting on the Future of Quantum Gravity

UCLA particle physicist Zvi Bern in 2009 with a bottle of wine he won in a bet against Paul Howe, then of King's College London.

But now, Bern is betting big on a once sidelined theory called supergravity, which posits the existence of new gravity-related particles that mirror gravitons' effects. Supergravity, developed in the 1970s, has long been assumed to suffer from the infinity problem, which would indicate that the theory is mathematically flawed. But the calculations were so difficult that no one could find out for sure — "until Bern and his friends came along," Stelle said. Using newfound tools and shortcuts, Bern and his team are now calculating these gravitational interactions with ever-increasing precision. Instead of blowing up, the theory keeps making sense.

Supergravity itself cannot exactly describe nature, because it was designed for a more symmetric theoretical world. But if the theory holds up in Bern's current wager with Stelle, then it could provide physicists with the scaffold they need to build a more realistic theory. "It means that supergravity has a very special structure," Bern said. "I believe it would be the key to unlocking a theory of gravity."

Bern's calculations are part of a larger drive to understand the full nature of gravity. He is dealing in handfuls of colliding gravitons, but the ultimate theory of quantum gravity must also make sense of the mighty swarms that constitute black holes. Profound conceptual puzzles posed by black holes suggest that the true theory will demand a radical new perspective on the universe — one in which space and time are mere illusions. One alternative approach makes use of the amplituhedron, an object that simplifies calculations of certain particle interactions and could help physicists resolve some of the puzzles.

"We're sort of on the right track," said Steve Giddings, a professor of theoretical physics at the University of California, Santa Barbara, who is a leading expert on black hole paradoxes. "We can see the outlines of a black hole in the calculations."

Going Quantum

Albert Einstein theorized that gravity is a consequence of curves in space and time. As the space-time fabric stretches under the weight of heavy objects, smaller objects fall toward them. Einstein's theory works perfectly for describing gravity on the macroscopic scale, where apples fall to the ground and Earth orbits the sun. But when his equations for calculating the outcomes of gravitational interactions are applied to the smallest possible ripples in the space-time fabric — the bundles of energy known as gravitons — the calculations go haywire. "Einstein gravity is polluted with infinities," Stelle said.

The problem is that gravitons can theoretically interact in infinitely many ways. Physicists calculate "scattering amplitudes," numbers that represent the probabilities of different outcomes of particle interactions, by drawing pictures of the various ways the particles can morph or shuffle during an interaction, and then summing the likelihoods of the different drawings. (The pictures are called "Feynman diagrams" after their inventor, Richard Feynman.) Unlikely, convoluted diagrams far outnumber likely, straightforward ones. This means that computing a scattering amplitude for each new level of precision requires drawing exponentially more Feynman diagrams and solving a vastly more complicated mathematical formula. In some cases, these formulas simplify neatly. For graviton interactions as defined by Einstein's equations, they do not.

Supergravity tries to help by adding new "supersymmetries" to Einstein's theory. Like mirrors, these dictate that if one type of particle exists, then so must its opposite. In a variant of the theory called N = 8 supergravity, which has eight such doublings, the new mirror-image particles allow physicists to cancel out some of the more troublesome parts of the formulas. This approach works for the first four levels of precision. But experts have long suspected that infinity would rear its head again if they tried to make the calculations more exact. "You reach a point where the diagrams are so complicated that supersymmetry can't cancel it anymore," explained Kristan Jensen, a physicist at Stony Brook University.

According to Bern, that long-held assumption "may not be true."

In the 1990s, Bern, Lance Dixon of the SLAC National Accelerator Laboratory in Menlo Park, California, and David Kosower of CEA Saclay in France developed powerful new techniques for computing scattering amplitudes, for which they will receive the 2014 J. J. Sakurai Prize for Theoretical Particle Physics in April. Their shortcuts have streamlined calculations about the known particles of nature, enabling theorists to predict with stunning precision the outcomes of collisions at the Large Hadron Collider in Switzerland, and then look for "new physics" in the form of deviations from these predictions. In the mid-2000s, Bern, Dixon, Kosower and other collaborators also began applying the techniques to the much more theoretical — and formidable — supergravity calculations that were abandoned decades ago. When the calculations started yielding finite results, "that was just an incredible shock," said John Joseph Carrasco, a physicist at Stanford University who works with Bern.

Double-copy team

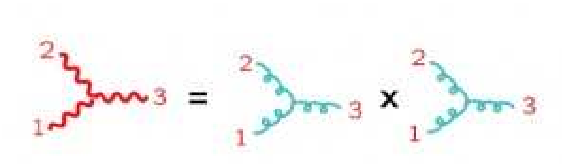
Courtesy of John Joseph Carrasco

Henrik Johannson of CERN, Zvi Bern of UCLA and John Joseph Carrasco of Stanford (left to right) discovered in 2008 that gravitons behave very much like two gluons laid on top of each other.

The most powerful shortcut for completing the supergravity calculations emerged from the discovery by Bern, Carrasco, and Henrik Johansson of CERN Laboratory that gravitons behave like two copies of gluons, the carriers of the strong nuclear force, which “glues” quarks together inside atomic nuclei. This “double copy” relationship between gravitons and gluons has shown up in every variant of supergravity the researchers have studied, and they expect it to hold in the correct theory of quantum gravity, too, regardless of whether supersymmetry exists in nature. In practice, the discovery means that once a gluon’s scattering amplitude has been computed in a particular form to a given level of precision, “extracting the gravity amplitude is child’s play,” Dixon said.

The double-copy property is more than a calculation tool. “It’s also a philosophical shift in how we should be viewing gravity theories,” Bern said. “This is very concrete and makes absolutely clear that [gravitons and gluons] really do belong together. They really should be part of a unified theory.”

Double-copy property



To calculate the properties of graviton collisions (red), physicists can use two copies of the equivalent interaction in gluons (blue), which are much easier to work with.

In Giddings’ words, “it’s extremely suggestive.” Because physicists have an operable quantum theory that describes gluons, called quantum chromodynamics, the double-copy property suggests that supergravity (or a related theory) might work, too.

For the latest wager with Stelle, Bern and his collaborators will subject N = 8 supergravity to an unprecedented test. If they can calculate what happens when gravitons collide to a level of precision known as “five loops” in a fictional world with 4.8 space-time dimensions, then Bern wins. In that case, Stelle must give him a bottle of Flint Dry from the Chapel Down Winery in England. “It’s the wine that was served at William and Kate’s wedding,” Stelle explained.

If, on the other hand, the calculation yields infinity in 4.8 dimensions, then Stelle wins. In that case, Bern must settle up with a bottle from Stags’ Leap in Napa Valley.

Of course, fractional dimensions don’t really exist. But Stelle and his colleagues have shown that the five-loop calculation for 4.8 dimensions roughly corresponds to a much more difficult seven-loop calculation in the dimensions of the real world. (The full seven-loop calculation is the subject of another bet between Bern and Nobel Prize winner David Gross of the University of California, Santa Barbara.) If the theory remains finite to such a degree, “that would be a real miracle,” Stelle said. The harmonious interplay between the particles in N = 8 supergravity would go beyond what physicists understand.

It’s too early to tell how the wager between Bern and Stelle will turn out. However, in work that appeared in Physical Review Letters in December, Bern’s team found “much better than expected behavior" of another variant of the theory called N = 4 supergravity, and that result has changed the odds. "It's fair to say things are looking in my favor now," Bern said.

Black Hole Woes

Any theory of quantum gravity must get to grips with black holes, which are described by Einstein's theory as inescapably steep curves in space-time, but which, at a more fundamental level, are intricate quantum systems that transcend description even in terms of gravitons. Explaining these systems may require a radical new perspective on how nature works.

Black holes form when particles collide with a total energy of more than 10 billion billion protons (called the "Planck energy"). At such high energies, an infinite number of Feynman diagrams are needed to make even a rough approximation of the scattering amplitude. This cripples physicists' efforts to directly calculate the detailed quantum properties of black holes, even those in the highly symmetric world governed by N = 8 supergravity. Extrapolating Bern and his colleagues' calculations for low-energy gravitons to high energies crudely reproduces the familiar picture of a black hole — that of a steep curve in space-time. But this extrapolation isn't detailed enough to address physicists' deepest question about black holes: what happens to information about the particles that fall in (the so-called information paradox).

According to the principles of quantum mechanics, information about the states of particles can never be destroyed. Thus, when particles plunge into black holes, the information must go in with them. But quantum mechanics also says that black holes evaporate and eventually disappear completely. Where does the information go?

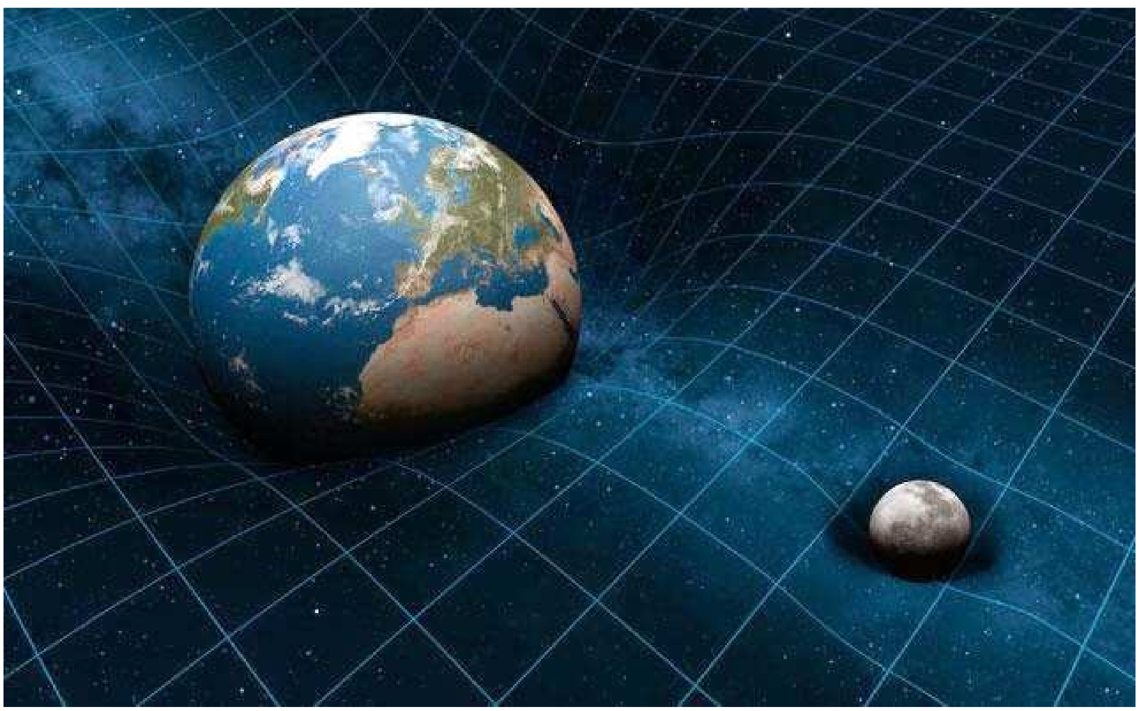
Physicists are still actively debating the information paradox, but there is a growing consensus that its resolution will ultimately force them to relinquish a long-standing assumption called locality, the notion that particles only interact from adjacent positions in space and time. If particles inside and outside black holes can somehow exchange information, then information from evaporating black holes can be rescued. "Locality is a cornerstone of our fundamental description of physics today," Giddings said, "but in my mind, the least crazy thing to do is modify it in some way."

Removing locality from particle physics could require a complete reformulation of the way Bern and other physicists calculate scattering amplitudes, because Feynman diagrams are drawn on the assumption that particles interact from adjacent points in space-time. Motivated by this problem, a group led by Nima Arkani-Hamed, a professor of physics at the Institute for Advanced Study in Princeton, N.J., recently discovered a much simpler approach to calculating scattering amplitudes — at least for a highly supersymmetric version of quantum physics. In the new approach, gluon scattering amplitudes can be computed by measuring the volume of an amplituhedron, a geometric object whose shape is determined by the number and properties of the gluons involved in an interaction. Locality does not enter into the calculation at all; the impression that collisions occur in space and time is merely a feature of the outcomes of calculations. [8]

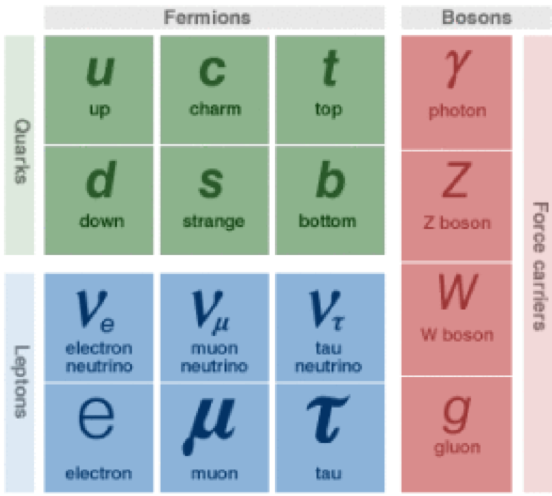
"Gravity" Fantasy or Reality

In modern physics, material in the universe is made up of quanta or "particles" such as electrons, protons and neutrons. These units can be said to relate through various forces or fields (strong, weak, electromagnetic, gravitational) for which there are matching "field quanta" such as photons and gluons. These quanta are usually understood as the particles that make up these fields, and while things are a bit more complex it is the right basic concept. We have a lot of experimental proof for these quanta, but there is one that's often stated for which we have no experimental proofs, that's the graviton.

One of the fundamental methods in quantum field theory is to begin with a wave form and then "quantize" it by the help of mathematical formalism. In this way you can display, for example, how photons ascend from the electromagnetic field. The same method can be applied with the gravitational field. Begin with gravitational waves, and then quantize it to derive gravitons. But there are some glitches with this methodology. In quantum field theory all fields act inside a flat background of space and time (named Minkowski space). Gravitational waves interfere with space and time itself, so to derive gravitons it's often supposed that the gravitational waves are a variation inside a background of Minkowski space. It this way you can take gravity as a field within flat space so that you can quantize it.



Of course, general relativity illustrates that is not how gravity works. Gravity is a result of space time curvature, so to quantize gravity you would have to quantize space time itself. Just how that might be done is one of the great unexplained mysteries in physics. So it's probable that gravitons don't exist. But it's usually considered that they do, since most physicists ponder that in the end quantum theory will be at the heart of everything. The present key approaches to quantum gravity, such as string theory and loop quantum gravity, forecast the reality of gravitons with the similar characteristics we see in the simple "quantized wave" method.



Even if gravitons are there, it's probable that we would never be able to perceive them. As one latest paper demonstrated, gravitons would interact so weakly with masses that you would require something like a Jupiter-mass detector circling a neutron star. Even then it would take more than a decade to perceive a single graviton. Even then the noise from particles like neutrinos would wash out your signal. If there's no applied way to sense gravitons, does it make any logic to talk of them as a scientific model?

Perhaps, assuming they continue inside a robust model of quantum gravity, there may be secondary ways of proving their actuality. For now, though, they are totally hypothetical. [7]

Quantum Gravity Measurement by Entanglement

In our idea, two quantum particles are prepared in an entangled state in between two different satellites orbiting the Earth. As long as they stay in the same orbit, the entanglement exists. However, at some point the orbit of one of the satellite needs to be changed. This is done by firing engines and accelerating to the new location.

The acceleration needed to change orbit is determined by the gravitational forces acting on the satellite: the more distant the new orbit we want to reach, the larger the time that the engines must be switched on to get the required velocity. This is due to the fact that gravity is more intense if the object is closer to the Earth.

We find that such acceleration – and thus, indirectly, gravity – changes the quality of entanglement between the two particles. If our calculations are right, this could be the first experimental proof that shows that gravity will have indirect effects on quantum entanglement. Also, if quantum technology has to be used in space, it is vital that this be taken into consideration. [6]

Quantum entanglement

Measurements of physical properties such as position, momentum, spin, polarization, etc. performed on entangled particles are found to be appropriately correlated. For example, if a pair of particles is generated in such a way that their total spin is known to be zero, and one particle is found to have clockwise spin on a certain axis, then the spin of the other particle, measured on the same axis, will be found to be counterclockwise. Because of the nature of quantum measurement, however, this behavior gives rise to effects that can appear paradoxical: any measurement of a property of a particle can be seen as acting on that particle (e.g. by collapsing a number of superimposed states); and in the case of entangled particles, such action must be on the entangled system as a whole. It thus appears that one particle of an entangled pair "knows" what measurement has been performed on the other, and with what outcome, even though there is no known means for such information to be communicated between the particles, which at the time of measurement may be separated by arbitrarily large distances. [4]

The Bridge

The accelerating electrons explain not only the Maxwell Equations and the Special Relativity, but the Heisenberg Uncertainty Relation, the wave particle duality and the electron's spin also, building the bridge between the Classical and Quantum Theories. [1]

Accelerating charges

The moving charges are self maintain the electromagnetic field locally, causing their movement and this is the result of their acceleration under the force of this field. In the classical physics the charges will distributed along the electric current so that the electric potential lowering along the current, by linearly increasing the way they take every next time period because this accelerated motion.
The same thing happens on the atomic scale giving a dp impulse difference and a dx way difference between the different part of the not point like particles.

Relativistic effect

Another bridge between the classical and quantum mechanics in the realm of relativity is that the charge distribution is lowering in the reference frame of the accelerating charges linearly: ds/dt = at (time coordinate), but in the reference frame of the current it is parabolic: $s = a/2\ t^2$ (geometric coordinate).

Heisenberg Uncertainty Relation

In the atomic scale the Heisenberg uncertainty relation gives the same result, since the moving electron in the atom accelerating in the electric field of the proton, causing a charge distribution on delta x position difference and with a delta p momentum difference such a way that they product is about the half Planck reduced constant. For the proton this delta x much less in the nucleon, than in the orbit of the electron in the atom, the delta p is much higher because of the greater proton mass.

This means that the electron and proton are not point like particles, but has a real charge distribution.

Wave – Particle Duality

The accelerating electrons explains the wave – particle duality of the electrons and photons, since the elementary charges are distributed on delta x position with delta p impulse and creating a wave packet of the electron. The photon gives the electromagnetic particle of the mediating force of the electrons electromagnetic field with the same distribution of wavelengths.

Atomic model

The constantly accelerating electron in the Hydrogen atom is moving on the equipotential line of the proton and it's kinetic and potential energy will be constant. Its energy will change only when it is changing its way to another equipotential line with another value of potential energy or getting free with enough kinetic energy. This means that the Rutherford-Bohr atomic model is right and only that changing acceleration of the electric charge causes radiation, not the steady acceleration. The steady acceleration of the charges only creates a centric parabolic steady electric field around the charge, the magnetic field. This gives the magnetic moment of the atoms, summing up the proton and electron magnetic moments caused by their circular motions and spins.

The Relativistic Bridge

Commonly accepted idea that the relativistic effect on the particle physics it is the fermions' spin - another unresolved problem in the classical concepts. If the electric charges can move only with accelerated motions in the self maintaining electromagnetic field, once upon a time they would reach the velocity of the electromagnetic field. The resolution of this problem is the spinning particle, constantly accelerating and not reaching the velocity of light because the acceleration is radial. One origin of the Quantum Physics is the Planck Distribution Law of the electromagnetic oscillators, giving equal intensity for 2 different wavelengths on any temperature. Any of these two wavelengths will give equal intensity diffraction patterns, building different asymmetric constructions, for example proton - electron structures (atoms), molecules, etc. Since the particles are centers of diffraction patterns they also have particle – wave duality as the electromagnetic waves have. [2]

The weak interaction

The weak interaction transforms an electric charge in the diffraction pattern from one side to the other side, causing an electric dipole momentum change, which violates the CP and time reversal symmetry. The Electroweak Interaction shows that the Weak Interaction is basically electromagnetic in nature. The arrow of time shows the entropy grows by changing the temperature dependent diffraction patterns of the electromagnetic oscillators.

Another important issue of the quark model is when one quark changes its flavor such that a linear oscillation transforms into plane oscillation or vice versa, changing the charge value with 1 or -1. This kind of change in the oscillation mode requires not only parity change, but also charge and time changes (CPT symmetry) resulting a right handed anti-neutrino or a left handed neutrino.

The right handed anti-neutrino and the left handed neutrino exist only because changing back the quark flavor could happen only in reverse, because they are different geometrical constructions, the u is 2 dimensional and positively charged and the d is 1 dimensional and negatively charged. It needs also a time reversal, because anti particle (anti neutrino) is involved.

The neutrino is a 1/2spin creator particle to make equal the spins of the weak interaction, for example neutron decay to 2 fermions, every particle is fermions with ½ spin. The weak interaction changes the entropy since more or less particles will give more or less freedom of movement. The entropy change is a result of temperature change and breaks the equality of oscillator diffraction intensity of the Maxwell–Boltzmann statistics. This way it changes the time coordinate measure and makes possible a different time dilation as of the special relativity.

The limit of the velocity of particles as the speed of light appropriate only for electrical charged particles, since the accelerated charges are self maintaining locally the accelerating electric force. The neutrinos are CP symmetry breaking particles compensated by time in the CPT symmetry, that is the time coordinate not works as in the electromagnetic interactions, consequently the speed of neutrinos is not limited by the speed of light.

The weak interaction T-asymmetry is in conjunction with the T-asymmetry of the second law of thermodynamics, meaning that locally lowering entropy (on extremely high temperature) causes the weak interaction, for example the Hydrogen fusion.

Probably because it is a spin creating movement changing linear oscillation to 2 dimensional oscillation by changing d to u quark and creating anti neutrino going back in time relative to the proton and electron created from the neutron, it seems that the anti neutrino fastest then the velocity of the photons created also in this weak interaction?

A quark flavor changing shows that it is a reflection changes movement and the CP- and T- symmetry breaking!!! This flavor changing oscillation could prove that it could be also on higher level such as atoms, molecules, probably big biological significant molecules and responsible on the aging of the life.

Important to mention that the weak interaction is always contains particles and antiparticles, where the neutrinos (antineutrinos) present the opposite side. It means by Feynman's interpretation that these particles present the backward time and probably because this they seem to move faster than the speed of light in the reference frame of the other side.

Finally since the weak interaction is an electric dipole change with ½ spin creating; it is limited by the velocity of the electromagnetic wave, so the neutrino's velocity cannot exceed the velocity of light.

The General Weak Interaction

The Weak Interactions T-asymmetry is in conjunction with the T-asymmetry of the Second Law of Thermodynamics, meaning that locally lowering entropy (on extremely high temperature) causes for

example the Hydrogen fusion. The arrow of time by the Second Law of Thermodynamics shows the increasing entropy and decreasing information by the Weak Interaction, changing the temperature dependent diffraction patterns. A good example of this is the neutron decay, creating more particles with less known information about them.
The neutrino oscillation of the Weak Interaction shows that it is a general electric dipole change and it is possible to any other temperature dependent entropy and information changing diffraction pattern of atoms, molecules and even complicated biological living structures.
We can generalize the weak interaction on all of the decaying matter constructions, even on the biological too. This gives the limited lifetime for the biological constructions also by the arrow of time. There should be a new research space of the Quantum Information Science the 'general neutrino oscillation' for the greater then subatomic matter structures as an electric dipole change.
There is also connection between statistical physics and evolutionary biology, since the arrow of time is working in the biological evolution also.
The Fluctuation Theorem says that there is a probability that entropy will flow in a direction opposite to that dictated by the Second Law of Thermodynamics. In this case the Information is growing that is the matter formulas are emerging from the chaos. So the Weak Interaction has two directions, samples for one direction is the Neutron decay, and Hydrogen fusion is the opposite direction.

Fermions and Bosons

The fermions are the diffraction patterns of the bosons such a way that they are both sides of the same thing.

Van Der Waals force

Named after the Dutch scientist Johannes Diderik van der Waals – who first proposed it in 1873 to explain the behaviour of gases – it is a very weak force that only becomes relevant when atoms and molecules are very close together. Fluctuations in the electronic cloud of an atom mean that it will have an instantaneous dipole moment. This can induce a dipole moment in a nearby atom, the result being an attractive dipole–dipole interaction.

Electromagnetic inertia and mass

Electromagnetic Induction

Since the magnetic induction creates a negative electric field as a result of the changing acceleration, it works as an electromagnetic inertia, causing an electromagnetic mass. [1]

Relativistic change of mass

The increasing mass of the electric charges the result of the increasing inductive electric force acting against the accelerating force. The decreasing mass of the decreasing acceleration is the result of the inductive electric force acting against the decreasing force. This is the relativistic mass change explanation, especially importantly explaining the mass reduction in case of velocity decrease.

The frequency dependence of mass

Since $E = hv$ and $E = mc^2$, $m = hv /c^2$ that is the m depends only on the v frequency. It means that the mass of the proton and electron are electromagnetic and the result of the electromagnetic induction, caused by the changing acceleration of the spinning and moving charge! It could be that the $\boldsymbol{m_o}$ inertial mass is the result of the spin, since this is the only accelerating motion of the electric charge. Since the accelerating motion has different frequency for the electron in the atom and the proton, they masses are different, also as the wavelengths on both sides of the diffraction pattern, giving equal intensity of radiation.

Electron – Proton mass rate

The Planck distribution law explains the different frequencies of the proton and electron, giving equal intensity to different lambda wavelengths! Also since the particles are diffraction patterns they have some closeness to each other – can be seen as a gravitational force. [2]

There is an asymmetry between the mass of the electric charges, for example proton and electron, can understood by the asymmetrical Planck Distribution Law. This temperature dependent energy distribution is asymmetric around the maximum intensity, where the annihilation of matter and antimatter is a high probability event. The asymmetric sides are creating different frequencies of electromagnetic radiations being in the same intensity level and compensating each other. One of these compensating ratios is the electron – proton mass ratio. The lower energy side has no compensating intensity level, it is the dark energy and the corresponding matter is the dark matter.

Gravity from the point of view of quantum physics

The Gravitational force

The gravitational attractive force is basically a magnetic force.

The same electric charges can attract one another by the magnetic force if they are moving parallel in the same direction. Since the electrically neutral matter is composed of negative and positive charges they need 2 photons to mediate this attractive force, one per charges. The Bing Bang caused parallel moving of the matter gives this magnetic force, experienced as gravitational force.

Since graviton is a tensor field, it has spin = 2, could be 2 photons with spin = 1 together.

Also true for the gluons has spin = 1 of the strong interaction.

Gluons are elementary particles that act as the exchange particles (or gauge bosons) for the strong force between quarks, analogous to the exchange of photons in the electromagnetic force between two charged particles. [9]

You can think about photons as virtual electron – positron pairs, obtaining the necessary virtual mass for gravity.

The mass as seen before a result of the diffraction, for example the proton – electron mass rate Mp=1840 Me. In order to move one of these diffraction maximum (electron or proton) we need to intervene into the diffraction pattern with a force appropriate to the intensity of this diffraction maximum, means its intensity or mass.

The Big Bang caused acceleration created radial currents of the matter, and since the matter is composed of negative and positive charges, these currents are creating magnetic field and attracting forces between the parallel moving electric currents. This is the gravitational force experienced by the matter, and also the mass is result of the electromagnetic forces between the charged particles. The positive and negative charged currents attracts each other or by the magnetic forces or by the much stronger electrostatic forces!?

The gravitational force attracting the matter, causing concentration of the matter in a small space and leaving much space with low matter concentration: dark matter and energy.
There is an asymmetry between the mass of the electric charges, for example proton and electron, can understood by the asymmetrical Planck Distribution Law. This temperature dependent energy distribution is asymmetric around the maximum intensity, where the annihilation of matter and antimatter is a high probability event. The asymmetric sides are creating different frequencies of electromagnetic radiations being in the same intensity level and compensating each other. One of these compensating ratios is the electron – proton mass ratio. The lower energy side has no compensating intensity level, it is the dark energy and the corresponding matter is the dark matter.

The Higgs boson

By March 2013, the particle had been proven to behave, interact and decay in many of the expected ways predicted by the Standard Model, and was also tentatively confirmed to have + parity and zero spin, two fundamental criteria of a Higgs boson, making it also the first known scalar particle to be discovered in nature, although a number of other properties were not fully proven and some partial results do not yet precisely match those expected; in some cases data is also still awaited or being analyzed.

Since the Higgs boson is necessary to the W and Z bosons, the dipole change of the Weak interaction and the change in the magnetic effect caused gravitation must be conducted. The Wien law is also important to explain the Weak interaction, since it describes the T_{max} change and the diffraction patterns change. [2]

Higgs mechanism and Quantum Gravity

The magnetic induction creates a negative electric field, causing an electromagnetic inertia. Probably it is the mysterious Higgs field giving mass to the charged particles? We can think about the photon as an electron-positron pair, they have mass. The neutral particles are built from negative and positive charges, for example the neutron, decaying to proton and electron. The wave – particle duality makes sure that the particles are oscillating and creating magnetic induction as an inertial mass, explaining also the relativistic mass change. Higher frequency creates stronger magnetic induction, smaller frequency results lesser magnetic induction. It seems to me that the magnetic induction is the secret of the Higgs field.

In particle physics, the Higgs mechanism is a kind of mass generation mechanism, a process that gives mass to elementary particles. According to this theory, particles gain mass by interacting with the Higgs field that permeates all space. More precisely, the Higgs mechanism endows gauge bosons in a gauge theory with mass through absorption of Nambu–Goldstone bosons arising in spontaneous symmetry breaking.

The simplest implementation of the mechanism adds an extra Higgs field to the gauge theory. The spontaneous symmetry breaking of the underlying local symmetry triggers conversion of components of this Higgs field to Goldstone bosons which interact with (at least some of) the other fields in the theory, so as to produce mass terms for (at least some of) the gauge bosons. This mechanism may also leave behind elementary scalar (spin-0) particles, known as Higgs bosons.

In the Standard Model, the phrase "Higgs mechanism" refers specifically to the generation of masses for the $W^{\pm}$, and Z weak gauge bosons through electroweak symmetry breaking. The Large Hadron Collider at CERN announced results consistent with the Higgs particle on July 4, 2012 but stressed that further testing is needed to confirm the Standard Model.

What is the Spin?

So we know already that the new particle has spin zero or spin two and we could tell which one if we could detect the polarizations of the photons produced. Unfortunately this is difficult and neither ATLAS nor CMS are able to measure polarizations. The only direct and sure way to confirm that the particle is indeed a scalar is to plot the angular distribution of the photons in the rest frame of the centre of mass. A spin zero particles like the Higgs carries no directional information away from the original collision so the distribution will be even in all directions. This test will be possible when a much larger number of events have been observed. In the mean time we can settle for less certain indirect indicators.

The Graviton

In physics, the graviton is a hypothetical elementary particle that mediates the force of gravitation in the framework of quantum field theory. If it exists, the graviton is expected to be massless (because the gravitational force appears to have unlimited range) and must be a spin-2 boson. The spin follows from the fact that the source of gravitation is the stress-energy tensor, a second-rank tensor (compared to electromagnetism's spin-1 photon, the source of which is the four-current, a first-rank tensor). Additionally, it can be shown that any massless spin-2 field would give rise to a force indistinguishable from gravitation, because a massless spin-2 field must couple to (interact with) the stress-energy tensor in the same way that the gravitational field does. This result suggests that, if a massless spin-2 particle is discovered, it must be the graviton, so that the only experimental verification needed for the graviton may simply be the discovery of a massless spin-2 particle. [3]

Conclusions

The physicists are actively discussing how the different threads of quantum gravity research might come together. A vague picture may be emerging — one of gravitons, gluons and other particles acting in concert, perhaps as the components of some grand, nonlocal geometry — but they caution that it will take a huge amount of effort to make their loose ideas mathematically concrete, and to adapt them to the real world. As Jensen put it, “There’s the stories and then there’s the calculations.” [8]

As one latest paper demonstrated, gravitons would interact so weakly with masses that you would require something like a Jupiter-mass detector circling a neutron star. Even then it would take more than a decade to perceive a single graviton. Even then the noise from particles like neutrinos would wash out your signal. [7]

The accelerated charges self-maintaining potential shows the locality of the relativity, working on the quantum level also. [1]

The Secret of Quantum Entanglement that the particles are diffraction patterns of the electromagnetic waves and this way their quantum states every time is the result of the quantum state of the intermediate electromagnetic waves. [2]

One of the most important conclusions is that the electric charges are moving in an accelerated way and even if their velocity is constant, they have an intrinsic acceleration anyway, the so called spin, since they need at least an intrinsic acceleration to make possible they movement .

The bridge between the classical and quantum theory is based on this intrinsic acceleration of the spin, explaining also the Heisenberg Uncertainty Principle. The particle – wave duality of the electric charges and the photon makes certain that they are both sides of the same thing. Basing the gravitational force on the accelerating Universe caused magnetic force and the Planck Distribution Law of the electromagnetic waves caused diffraction gives us the basis to build a Unified Theory of the physical interactions.

In the future, the researchers plan to further investigate both the fundamental and practical aspects of quantum and relativistic effects.

Since graviton is a tensor field, it has spin = 2, could be 2 photons with spin = 1 together. Also true for the gluons has spin = 1 of the strong interaction. This is also a good evidence of the Electro-Strong theory. [10]

References

[1] The Magnetic field of the Electric current and the Magnetic induction

http://academia.edu/3833335/The_Magnetic_field_of_the_Electric_current

[2] 3 Dimensional String Theory

http://academia.edu/3834454/3_Dimensional_String_Theory

[3] Graviton Production By Two Photon and Electron-Photon Processes In Kaluza-Klein Theories With Large Extra Dimensions

http://arxiv.org/abs/hep-ph/9909392

[4] Quantum Entanglement

http://en.wikipedia.org/wiki/Quantum_entanglement

[5] Space-based experiment could test gravity's effects on quantum entanglement

http://phys.org/news/2014-05-space-based-gravity-effects-quantum-entanglement.html

[6] To test the effect of gravity on quantum entanglement, we need to go to space

http://phys.org/news/2014-06-effect-gravity-quantum-entanglement-space.html#nwlt

[7] "Gravity" Fantasy or Reality

http://sci-techuniverse.blogspot.co.il/2015/01/gravity-fantasy-or-reality.html?showComment=1421917869371#c7146618580382848673

[8] Betting on the Future of Quantum Gravity

https://www.quantamagazine.org/20140314-betting-on-the-future-of-quantum-gravity/

[9] https://en.wikipedia.org/wiki/Gluon

[10] https://www.academia.edu/4196521/The_Electro-Strong_Interaction

[11] Can LIGO test Quantum Gravity?

http://www.forbes.com/sites/startswithabang/2016/02/16/can-ligo-test-quantum-gravity