Announcement on Gravitational Waves

Scientists are set to make a major announcement Thursday on efforts to pinpoint the existence of gravitational waves, or ripples of space and time that transport energy across the universe. [6]

Scientists at the National Institute for Space Research in Brazil say an undiscovered type of matter could be found in neutron stars (illustration shown). Here matter is so dense that it could be 'squashed' into strange matter. This would create an entire 'strange star' - unlike anything we have seen. [4]

The changing acceleration of the electrons explains the created negative electric field of the magnetic induction, the electromagnetic inertia, the changing relativistic mass and the Gravitational Force, giving a Unified Theory of the physical forces. Taking into account the Planck Distribution Law of the electromagnetic oscillators also, we can explain the electron/proton mass rate and the Weak and Strong Interactions.

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Preface

Today the most popular enigma is the gravitational force after founding the Higgs boson experimentally. Although the graviton until now is a theoretical particle, its existence is a necessary basis of the Quantum Gravitation and the Theory of Everything.

The electromagnetic origin of mass gives an explanation of the inertia, the relativistic change of mass and also the gravitational force.

Announcement Thursday on Einstein's gravitational waves

Scientists are set to make a major announcement Thursday on efforts to pinpoint the existence of gravitational waves, or ripples of space and time that transport energy across the universe.

The waves themselves have never before been directly measured, though Albert Einstein said a century ago they were out there, according to his theory of general relativity.

They are believed to form around massive objects like black holes and neutron stars, warping space and time.

If gravitational waves have been spotted, it would mark one of the biggest scientific discoveries of our time, filling in a major gap in our understanding of how the universe was born.

Rumors began circulating last month that scientists at the Advanced Laser Interferometer Gravitational Wave Observatory, or LIGO, were writing up a paper on gravitational waves they had discovered using US-based detectors.

"My earlier rumor about LIGO has been confirmed by independent sources. Stay tuned! Gravitational waves may have been discovered!! Exciting," said a message on Twitter from Arizona State University cosmologist Lawrence Krauss, who does not work with LIGO.

His words sparked a firestorm of speculation.

An announcement will be made Thursday at 10:30 am (1530 GMT) at the National Press Club in the US capital Washington.

The event brings "together scientists from Caltech, MIT and the LIGO Scientific Collaboration to update the scientific community on efforts to detect them," a National Science Foundation statement read.

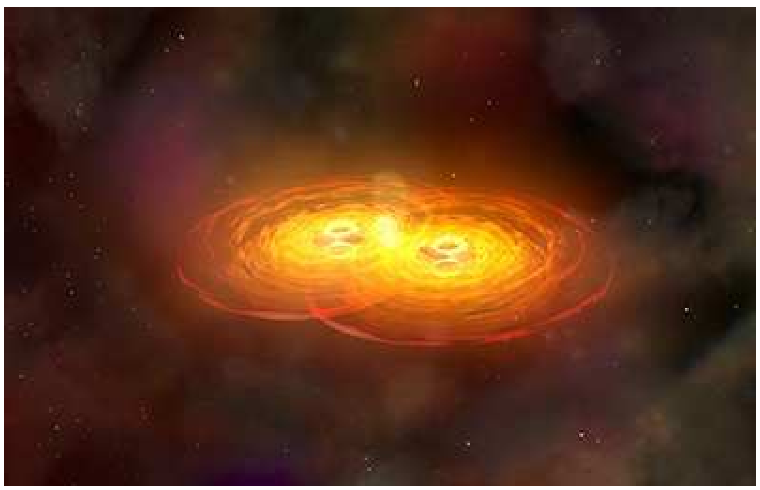
They will provide "a status report on the effort to detect gravitational waves –- or ripples in the fabric of spacetime -– using the Laser Interferometer Gravitational-wave Observatory (LIGO)," it said.

LIGO is a dual set of identical detectors built by scientists at MIT and Caltech to pick up "incredibly tiny vibrations from passing gravitational waves," said the statement.

One detector is located in Livingston, Louisiana. The other is in Hanford, Washington.

A team of scientists on a project called BICEP2 (Background Imaging of Cosmic Extragalactic Polarization) announced in 2014 that they had discovered these very ripples in space time, but soon admitted that their findings may have been just galactic dust. [6]

Are gravitational waves being 'redshifted' away by the cosmological constant?



Two merging galaxies with black holes at their centres.

The theoretical framework underlying gravitational waves may have to be revamped to account for dark energy and the acceleration of the expansion of the universe. That's the conclusion of researchers in the US, who say that while gravitational waves from nearby sources will be unaffected, next-generation detectors such as the Laser Interferometer Space Antenna (LISA) and the Einstein Telescope – which aim to detect gravitational waves from billions of light-years away – may fall foul of the expansion of the universe. While such telescopes will still detect gravitational waves, the signal detected from more distant waves could be fairly different to what is currently expected, say the researchers.

Dark energy is best explained by a small but positive value for the cosmological constant, which describes the energy density of space. It was the famous factor that Albert Einstein discarded from his general theory of relativity, when it was found in 1929 that the universe was expanding. For the next 69 years, theorists assumed that the cosmological constant was equal to zero. However, in 1998, it was discovered that the expansion of the universe was accelerating, driven by the mysterious dark energy, and the cosmological constant was back in the running.

Because the value of the cosmological constant is very small (10–52 m2), it had been assumed that it would have a negligible effect on the mathematical descriptions of gravitational waves. However, Abhay Ashtekar and colleagues at the Institute for Gravitation and the Cosmos at Penn State University in the US believe that it throws a spanner into the works of our current gravitational-wave theories.

Gravitational kicks

"Even a tiny cosmological constant casts a long shadow on the theory of gravitational waves," says Ashtekar. He told physicsworld.com that "the current theory, laid down some 50 years ago by Hermann Bondi, Rainer Sachs and Roger Penrose, makes such strong use of the assumption that the cosmological constant equals zero that it now has to be rebuilt, starting from its foundations."

Ashtekar and team have already begun this process, deriving a new generalization for Einstein's famous quadrupole formula, which describes the rate at which gravitational waves carry away energy from a system involving two or more massive objects, such as a binary black hole. The merger of two black holes into one can give the combined black hole a "kick" in one direction – the team's work on modifying the quadrupole formula describes a more accurate version of these kicks.

However, rebuilding the overall theoretical framework of gravitational waves developed by Bondi, Sachs and Penrose in the 1960s is a far greater challenge. "For a cosmological constant greater than zero, we do not yet know what gravitational waves mean in full general relativity, nor do we have expressions for the energy and angular momentum that they carry," says Ashtekar.

Going the distance

According to the Penn State trio, the effect of the cosmological constant is a cumulative one – the more distant a gravitational-wave-emitting object is, the more expanding space the gravitational waves have to cross to reach us, and therefore the greater the effect of the cosmological constant on them.

The current generation of ground-based detectors, such as Advanced LIGO, can only detect gravitational waves from objects up to about 800 million light-years away – according to Ashtekar, this is not far enough for the cosmological constant to have a noticeable effect. However, LISA and the Einstein Telescope should be able to detect gravitational waves from the other side of the visible universe, and the mathematical models for these signals will need revisiting.

"I'm intrigued by the claim that there might be some measurable consequences for very distant and long wavelength sources that future detectors might probe," says Martin Hendry, at the University of Glasgow, who was not involved in the Penn work. He agrees with the team's conclusion that current detectors looking at nearby sources won't be affected by the cosmological constant.

Looking ahead

B S Sathyaprakash at Cardiff University, who was also not involved in the current work, suggests that "gravitational-wave signals that we detect from cosmological distances might carry the signature of dark energy," and could be used to probe it. "It will be very interesting to see how our signals are modified by the inclusion of the corrections predicted by [Ashtekar's] work, and this is what we look forward to doing in the coming years."

The likes of LISA and the Einstein Telescope will not be operational before the 2030s, giving theorists the chance to rework the equations. Ashtekar says that it is "now clear that the reason the problem had remained open so long was because the inclusion of a cosmological constant, however small, requires a deep change in the basic conceptual structure and mathematical techniques needed to describe gravitational waves in full general relativity".

The research is to be published in Physical Review Letters. A preprint is available on the arXiv server. [5]

Probing Strange Stars with Advanced Gravitational Wave

The only known way to find strange matter at the moment would be to confirm its existence within neutron stars. On Earth, it is currently impossible to directly observe strange matter, even in places like the Large Hadron Collider at Cern in Switzerland. Pictured is the Large Hadron Collider Beauty experiment (LHCb).

 'As its name says, a neutron star is a star made up of neutrons - which are made up of two down and one up quarks,' Dr Moraes continued.

'It is a star of very high density and rapid rotation rate. Most of them have masses close to 1.3-1.4 solar masses.'

Most matter we see comes in two 'flavours', made up of just two types of fundamental particles - up and down quarks.

WHAT IS A NEUTRON STAR?

When the core of a massive star undergoes gravitational collapse at the end of its life, protons and electrons are literally scrunched together, leaving behind one of nature's most wondrous creations: a neutron star.

Neutron stars cram roughly 1.3 to 2.5 solar masses into a city-sized sphere perhaps 12 miles (20 kilometers) across.

Matter is packed so tightly that a sugar-cube-sized amount of material would weigh more than 1 billion tons, about the same as Mount Everest.

But in these extreme conditions a rare type of three-flavour matter, made of up, down and strange quarks, could be being created.

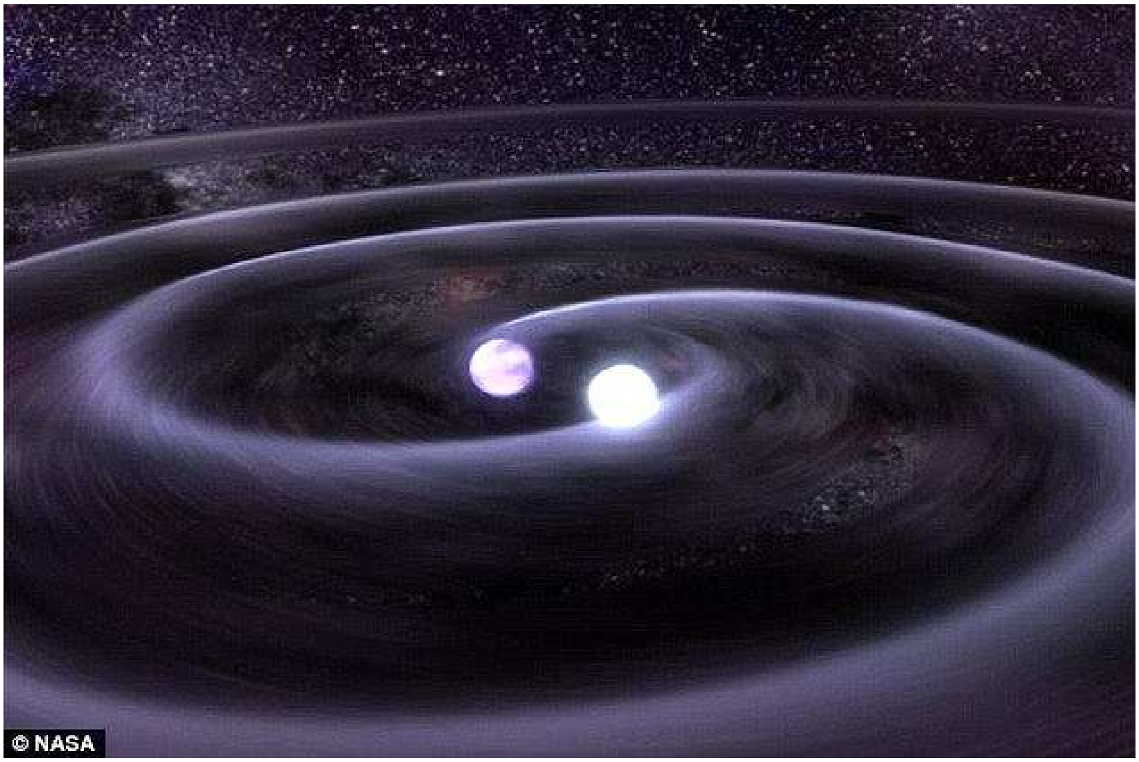
This is what strange matter would be. And Dr Moraes says, if the neutron star is massive enough and rotating at a fast enough speed, the entire star could be made of this matter.

The star would be much smaller and lighter than a neutron star. For example, a neutron star with a mass 0.2 times that of the sun would have a radius greater than nine miles (15km), but a strange star of the same mass would be less than a third the size.

One of the implications of the theory, if true, would be that there might be more types of matter in the universe than we know of.

Dr Moraes says, as we cannot observe individual fundamental particles like quarks on Earth, the only way to prove strange matter's existence would be to spot it in a neutron star.

Interestingly, though, proving that strange stars exist could also provide a detection for one of the 'holy grails' of astronomy - gravitational waves.



Dr Moraes says the interaction of a neutron star and a strange star (illustration shown) could create ripples in space-times, resulting in gravitational waves. These are one of the 'holy grails' of astronomy that have been impossible to detect in other experiments so far. [4]

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 $E = h\nu$ and $E = mc^2$, $m = h\nu /c^2$ that is the m depends only on the ν 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.

If the mass is electromagnetic, then the gravitation is also electromagnetic effect caused by the accelerating Universe! The same charges would attract each other if they are moving parallel by the magnetic effect.

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]

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.

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 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]

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.

In my opinion, the best explanation of the Higgs mechanism for a lay audience is the one invented by David Miller. You can find it here: http://www.strings.ph.qmul.ac.uk/~jmc/epp/higgs3.html .
The field must come first. The boson is an excitation of the field. So no field, no excitation. On the other hand in quantum field theory it is difficult to separate the field and the excitations.
The Higgs field is what gives particles their mass.
There is a video that gives an idea as to the Higgs field and the boson. It is here: http://www.youtube.com/watch?v=RIg1Vh7uPyw . Note that this analogy isn't as good as the Miller one, but as is usually the case, if you look at all the analogies you'll get the best understanding of the situation.

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

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.

Conclusions

The latest theory was proposed by Dr Pedro Moraes and Dr Oswaldo Miranda, both of the National Institute for Space Research in Brazil. They say that some types of neutron stars might be made of a new type of matter called strange matter. What the properties of this matter would be, though, are unknown - but it would likely be a ‘liquid’ of several types of sub-atomic particles. [4]

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