Dark Matter in a Hidden Sector

Currently, one of the strongest candidates for dark matter is weakly interacting massive particles, or WIMPS, although so far this hypothetical particle has not yet been directly detected. Now in a new study, physicists have proposed that dark matter is not a WIMP, and further, it is not any particle that is so far known or theorized to exist. [18]

In yet another attempt to nail down the elusive nature of dark matter, a European team of researchers has used a supercomputer to develop a profile of the yet-to-be-detected entity that appears to pervade the universe. [17]

MIT physicists are proposing a new experiment to detect a dark matter particle called the axion. If successful, the effort could crack one of the most perplexing unsolved mysteries in particle physics, as well as finally yield a glimpse of dark matter. [16]

Researches at Stockholm University are getting closer to light dark-matter particle models. Observations rule out some axion-like particles in the quest for the content of dark matter. The article is now published in the Physical Review Letters. [15]

Scientists have detected a mysterious X-ray signal that could be caused by dark matter streaming out of our Sun's core.

Hidden photons are predicted in some extensions of the Standard Model of particle physics, and unlike WIMPs they would interact electromagnetically with normal matter.

In particle physics and astrophysics, weakly interacting massive particles, or WIMPs, are among the leading hypothetical particle physics candidates for dark matter.

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.

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Author: George Rajna

The Big Bang

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.
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Dark matter may be hiding in a hidden sector

Currently, one of the strongest candidates for dark matter is weakly interacting massive particles, or WIMPS, although so far this hypothetical particle has not yet been directly detected. Now in a new study, physicists have proposed that dark matter is not a WIMP, and further, it is not any particle that is so far known or theorized to exist.

Instead, the physicists argue that dark matter is made of particles from one of the many "hidden sectors" that are thought to exist outside of the "visible sector" that encompasses our entire visible world. The team of researchers, Bobby Acharya, Sebastian Ellis, Gordon Kane, Brent Nelson, and Malcolm Perry, from institutions in the UK, Italy, and the US, has published their study in a recent issue of Physical Review Letters.

Hidden sectors are so-named because particles in these sectors don't feel the strong and electroweak forces like those in the visible sector do, which greatly reduces their interaction with the visible sector. So hidden sector particles could be all around us—we just currently have no way to detect them.

In the proposed scenario, dark matter consists of particles in the hidden sector that communicate through a portal from the hidden sector to the visible sector, and in this way exert the gravitational effects that scientists have long observed.

While such an idea may sound far-fetched, hidden sectors and portals have long been components of string theory and M-theory—two theories that seek to explain particle physics at its most fundamental level.

The main support for the new claim boils down to a question of stability. In general, heavier particles decay into lighter particles. So lighter particles, being more stable, are much more likely candidates for dark matter. This is where the long-standing support for WIMPs comes from, since WIMPs are the lightest supersymmetric particle, and therefore, until now, considered to be stable.

However, since approximately 100 hidden sectors are thought to exist, but only one visible sector, the scientists argue in the new study that some hidden sector likely contains a particle that is even lighter than WIMPs.

The scientists show that WIMPs could theoretically decay into one or more lighter hidden sector particles, which could in turn decay into even lighter hidden sector particles. So the lightest supersymmetric particle in the visible sector wouldn't be stable enough to be dark matter. Instead, according to this argument, some currently unknown hidden sector particle would be a much more likely dark matter candidate.

"The greatest significance of our work is that it forces theorists to rethink the paradigm of what is called WIMP dark matter," Ellis, a physicist at the University of Michigan, told Phys.org. "WIMPs have been the most popular candidates for what constitutes dark matter for over 30 years. A WIMP is a particle a bit like the Higgs or Z-boson that are electrically neutral, heavy particles which participate in the weak nuclear interactions, but unlike the Higgs or Z-boson, WIMP dark matter would be stable on cosmological scales. WIMP dark matter has most commonly been discussed within the context of supersymmetry (SUSY).

"For 30 years, theorists have thought that in SUSY models, the lightest SUSY particle was a good dark matter candidate due to its stability. However, in our paper we argue that if you take the Standard Model of particle physics as residing in a greater, string/M-theory framework, then supersymmetric WIMPs are probably not a good dark matter candidate, because we show that they are typically unstable.

"The string landscape encompasses a vast number of possible low-energy theories. However, we found that nearly all of the landscape would exhibit this feature of WIMP instability. Such a conclusion means that if we are to think seriously of embedding our visible universe in a string theory, we have to seriously consider the natural possibility that dark matter resides in a hidden sector, or we are forced into a very untypical corner of the string landscape."

If dark matter does turn out to be a hidden sector particle, it would explain why WIMPs have been so difficult to detect in particle colliders. In order to detect a WIMP, scientists will have to modify their search and look in different places.

"If dark matter comes from a hidden sector, it poses a serious issue of how to detect it, other than through its gravitational interactions," Ellis said. "String/M-theory can provide so-called 'portals' which connect these hidden sectors to our visible sector, thus potentially leading to a means of searching for hidden sector dark matter. Also, if dark matter is 'proven' experimentally to be in a hidden sector, it would fit very naturally with typical models of the universe that arise in string and M-theory."

In the future, the scientists plan to further investigate the exact signature of a WIMP decaying into a hidden sector particle, which would guide future experiments.

"We are currently finalizing a follow-up paper where we consider typical string/M-theory hidden sector constructions which could give good candidates for dark matter," Ellis said. "Most importantly, we find there are such candidates. The typical signature of such constructions is that when SUSY particles are produced in a collider, the WIMP will decay promptly into the hidden sector and other visible particles. Thus one would expect the typical collider signature for SUSY, namely missing energy, but accompanied by more particles than in a typical SUSY event." [18]

Across the universe: simulated distribution of dark matter

In yet another attempt to nail down the elusive nature of dark matter, a European team of researchers has used a supercomputer to develop a profile of the yet-to-be-detected entity that appears to pervade the universe. Physicists led by Zoltan Fodor of the University of Wuppertal have predicted the masses of dark-matter candidates called axions using the JUQUEEN (Blue Gene/Q) supercomputer at the Forschungszentrum Jülich research institute in Germany. These hypothetical particles are promising dark-matter candidates that are not described by the Standard Model of particle physics but are predicted by an extension to quantum chromodynamics (QCD). Axions are thought to have exceedingly small masses and could, in theory, be detected directly. "However, to find this kind of evidence it would be extremely helpful to know what kind of mass we are looking for," says team-member Andreas Ringwald at DESY in Hamburg. "Otherwise the search could take decades, because one would have to scan far too large a range." The team's simulations showed that if axions exist, they should have a mass of 50–1500 meV, making them up to 10 billion times lighter than electrons. This would require every cubic centimetre of the universe to contain on average 10 million such ultra-lightweight particles. "The results we are presenting will probably lead to a race to discover these particles," says Fodor. The team says that within the next few years, it should be possible to either confirm or rule out the existence of axions experimentally. The simulations are described in Nature. [17]

Team simulates a magnetar to seek dark matter particle

MIT physicists are proposing a new experiment to detect a dark matter particle called the axion. If successful, the effort could crack one of the most perplexing unsolved mysteries in particle physics, as well as finally yield a glimpse of dark matter.

Axions are hypothetical elementary particles that are thought to be among the lightest particles in the universe—about one-quintillionth the size of a proton. These ultralight particles are virtually invisible, yet if they exist, axions and other yet-unobserved particles may make up 80 percent of the material in the universe, in the form of dark matter.

In a paper published online in Physical Review Letters, the MIT team proposes an experiment to detect axions by simulating an extreme astrophysical phenomenon known as a magnetar—a type of neutron star that generates an immensely powerful magnetic field. The physicists reasoned that in the presence of an axion such a huge magnetic field should waver ever so slightly, producing a second, vastly smaller magnetic field as a signature of the axion itself.

The team consists of MIT associate professor of physics Jesse Thaler, MIT Pappalardo Fellow Benjamin Safdi, and Yonatan Kahn PhD '15, now a postdoc at Princeton University. Together, they designed an experiment to recreate the physics of a magnetar in a controlled laboratory environment, using technology borrowed from magnetic resonance imaging (MRI).

The core of the experiment, which they've named ABRACADABRA (A Broadband/Resonant Approach to Cosmic Axion Detection with an Amplifying B-field Ring Apparatus), consists of a series of magnetic coils, wound in the shape of a toroid, or donut, which is then encased in a layer of superconducting metal and kept in a refrigerator at temperatures just above absolute zero, to minimize external noise. The scientists plan to use a highly sensitive magnetometer, placed inside the donut hole, to detect any signs of axions' influence.

"Axions are very strange, counterintuitive particles," Thaler says. "They're extremely light, with feeble interactions, and yet this particle may dominate the matter budget of the universe and be five times more abundant by mass than ordinary matter. So we really had to think hard on whether these particles are in principle detectable using current technology. It's extremely daunting."

A "tantalizing" particle

If they are detected, axions may also explain an outstanding dilemma in particle physics, known as the Strong CP (charge parity) problem: Since the 1970s, scientists have grown increasingly puzzled over what Safdi describes as "the indifference of neutrons to electric fields." Neutrons are elementary particles that are found in the nucleus of almost every atom in matter, and they do not carry a net charge.

"We don't expect neutrons to accelerate in the presence of an electric field because they don't carry electric charge, but you might expect them to rotate," Safdi says. "That's because we expect them to have an electric dipole moment, where you can think of a neutron having a plus charge on one side and a minus charge on the other. But from our current understanding, this rotation effect does not exist, whereas theory says it should."

Scientists have hypothesized that this bizarre effect may be explained by the axion, which would somehow remove a neutron's electric dipole moment. If so, the axion would modify electric and magnetic phenomena in a way that could be detectable experimentally.

"It's very tantalizing to say there might be a particle that serves this deep purpose, and even more so if we were to detect the presence of these particles in the form of dark matter," Thaler says.

The hunt is on

Currently, Thaler says most axion hunting has been carried out by researchers at the University of Washington who are running the Axion Dark Matter Experiment, or ADMX. The experiment uses a resonant microwave cavity, set within a large superconducting magnet, to detect very weak conversions of axions to microwave photons. The experiment is tuned to look for axions within a specific range of around one quadrillionth the mass of a proton.

Thaler and his team realized that they could extend this range, and look for much smaller, lighter particles, on the order of one quintillionth the mass of a proton, by recreating the physics of magnetars, in the lab.

"The Strong CP problem is associated with whether a neutron's spin responds to electric effects, and you can kind of think of a magnetar as one gigantic spin with big magnetic fields," Thaler explains. "If axions are coming in and changing the properties of nuclear matter to resolve the Strong CP problem, maybe axions can interact with this magnetar and allow you to see it in a new way. So the subtle effects of axions should be amplified."

The team's prototype design is surprisingly small—"about the palm of your hand," Safdi says. The researchers, who are theoretical physicists by training, are now working with experimentalists at MIT to build the prototype, which is designed to generate a baseline magnetic field of about 1 tesla, comparable to current MRI machines. If axions are present, that field should waver slightly, producing a very tiny oscillation at a frequency that is directly related to the axion's mass. Using a high-precision magnetometer, Thaler hopes to pick up that frequency and ultimately use it to identify the axion's size.

"Only recently have there been many good ideas to search for [low-frequency axions]," says Gray Rybka, an assistant professor of physics at the University of Washington and an ADMX researcher, who was not involved in the research. "The experiment proposed here builds on previous ideas and, if the authors are correct, may be the most practical experimental configuration that can explore some of the plausible lower-frequency axion regimes."

"We have an instrument that's sensitive to many wavelengths, and we can tickle it with an axion of one particular wavelength, and ABRACADABRA will resonate," Thaler says. "And we will be going into uncharted territory, where we could possibly see dark matter from this prototype. That would be amazing." [16]

Dark matter does not contain certain axion-like particles

Physicists are still struggling with the conundrum of identifying more than 80 percent of the matter in the universe. One possibility is that it is made up of extremely light particles that weigh less than a billionth of the mass of an electron. These particles are often called axion-like particles (ALPs). Since ALPs are hard to find, the researchers have not yet been able to test different types of ALPs that could be a constituent of dark matter.

For the first time, the researchers used data from NASA's gamma-ray telescope on the Fermi satellite to study light from the central galaxy of the Perseus galaxy cluster in the hunt for ALPs. The researchers found no traces of ALPs and for the first time, the observations were sensitive enough to exclude certain types of ALPs (ALPs can only constitute dark matter if they have certain characteristics).

ALPs cannot be detected directly, but there is a small chance that they transform into ordinary light and vice versa when traveling through a magnetic field. A research team at Stockholm University used a very bright light source, the central galaxy of the Perseus galaxy cluster, to look for these transformations. The gamma radiation from this galaxy could change its nature to ALPs while traveling through the magnetic field that fills the gas between the galaxies in the cluster.

"The ALPs we have been able to exclude could explain a certain amount of dark matter. What is particularly interesting is that with our analysis we are reaching a sensitivity that we thought could only be obtained with dedicated future experiments on Earth", says Manuel Meyer, post-doc at the Department of Physics, Stockholm University.

Searches for ALPs with the Fermi telescope will continue. More than 80 percent of the matter in the universe is unidentified. Dark matter shows itself only through its gravity, neither absorbing nor radiating any form of light. [15]

Astronomers may have detected the first direct evidence of dark matter

Scientists have detected a mysterious X-ray signal that could be caused by dark matter streaming out of our Sun's core.

Now scientists at the University of Leicester have identified a signal on the X-ray spectrum which appears to be a signature of 'axions' - a hypothetical dark matter particle that's never been detected before.

While we can't get too excited just yet - it will take years to confirm whether this signal really is dark matter - the discovery would completely change our understanding of how the Universe works.

After all, dark matter is the force that holds our galaxies together, so learning more about it is pretty important.

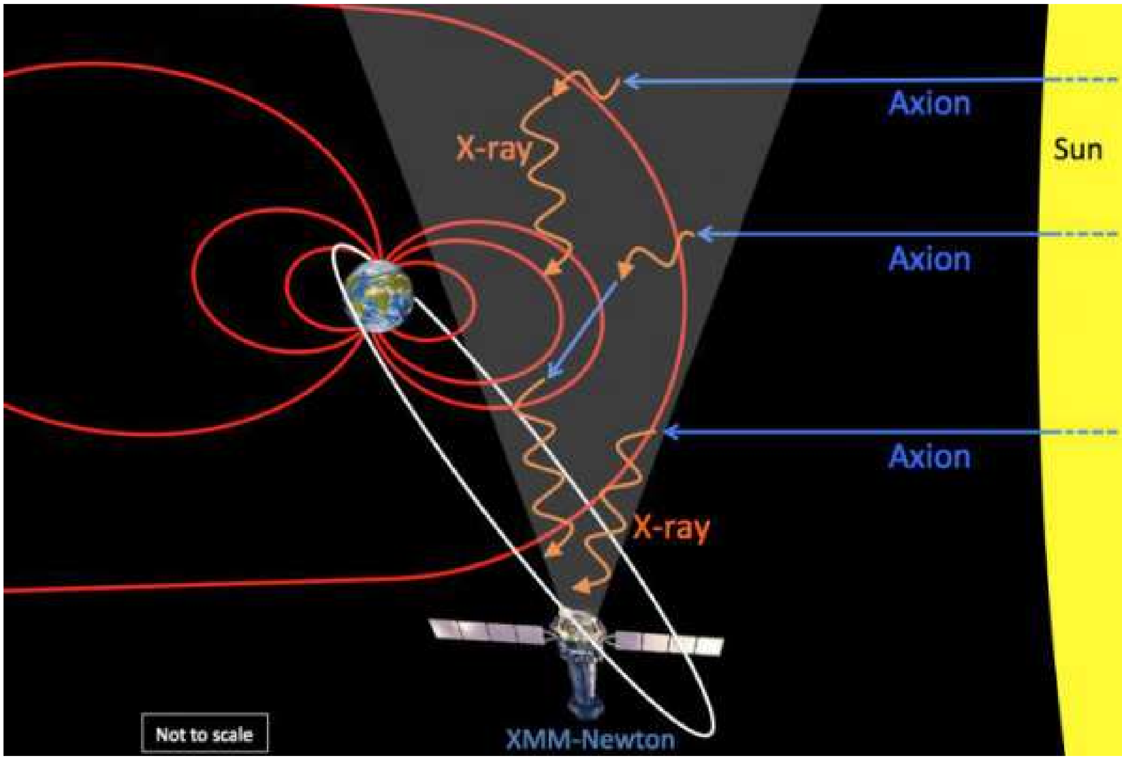
The researchers first detected the signal while searching through 15 years of measurements taking by the European Space Agency's orbiting XMM-Newton space observatory.

Unexpectedly, they noticed that the intensity of X-rays recorded by the spacecraft rose by about 10% whenever XMM-Newton was at the boundary of Earth's magnetic field facing the Sun - even once they removed all the bright X-ray sources from the sky. Usually, that X-ray background is stable.

"The X-ray background - the sky, after the bright X-ray sources are removed - appears to be unchanged whenever you look at it," said Andy Read, from the University of Leicester, one of the lead authors on the paper, in a press release. "However, we have discovered a seasonal signal in this X-ray background, which has no conventional explanation, but is consistent with the discovery of axions."

Researchers predict that axions, if they exist, would be produced invisibly by the Sun, but would convert to X-rays as they hit Earth's magnetic field. This X-ray signal should in theory be strongest when looking through the sunward side of the magnetic field, as this is where the Earth's magnetic field is strongest.

The next step is for the researchers to get a larger dataset from XMM-Newton and confirm the pattern they've seen in X-rays. Once they've done that, they can begin the long process of proving that they have, in fact, detecting dark matter streaming out of our Sun's core.



A sketch (not to scale) shows axions (blue) streaming out of the Sun and then converting into X-rays (orange) in the Earth's magnetic field (red). The X-rays are then detected by the XMM-Newton observatory. [13]

The axion is a hypothetical elementary particle postulated by the Peccei–Quinn theory in 1977 to resolve the strong CP problem in quantum chromodynamics (QCD). If axions exist and have low mass within a specific range, they are of interest as a possible component of cold dark matter. [14]

Hidden photons

Hidden photons are predicted in some extensions of the Standard Model of particle physics, and unlike WIMPs they would interact electromagnetically with normal matter. Hidden photons also have a very small mass, and are expected to oscillate into normal photons in a process similar to neutrino oscillation. Observing such oscillations relies on detectors that are sensitive to extremely small electromagnetic signals, and a number of these extremely difficult experiments have been built or proposed.

A spherical mirror is ideal for detecting such light because the emitted photons would be concentrated at the sphere's centre, whereas any background light bouncing off the mirror would pass through a focus midway between the sphere's surface and centre. A receiver placed at the centre could then pick up the dark-matter-generated photons, if tuned to their frequency – which is related to the mass of the incoming hidden photons – with mirror and receiver shielded as much as possible from stray electromagnetic waves.

Ideal mirror at hand

Fortunately for the team, an ideal mirror is at hand: a 13 m2 aluminium mirror used in tests during the construction of the Pierre Auger Observatory and located at the Karlsruhe Institute of

Technology. Döbrich and co-workers have got together with several researchers from Karlsruhe, and the collaboration is now readying the mirror by adjusting the position of each of its 36 segments to minimize the spot size of the focused waves. They are also measuring background radiation within the shielded room that will house the experiment. As for receivers, the most likely initial option is a set of low-noise photomultiplier tubes for measurements of visible light, which corresponds to hidden-photon masses of about 1 eV/C^2. Another obvious choice is a receiver for gigahertz radiation, which corresponds to masses less than 0.001 eV/C^2; however, this latter set-up would require more shielding.

Dark matter composition research - WIMP

The WIMP (Weakly interactive massive particles) form a class of heavy particles, interacting slightly with matter, and constitute excellent candidates with the nonbaryonic dark matter. The neutralino postulated by the supersymetric extensions of the standard model of particle physics. The idea of supersymmetry is to associate each boson to a fermion and vice versa. Each particle is then given a super-partner, having identical properties (mass, load), but with a spin which differes by 1/2. Thus, the number of particles is doubled. For example, the photon is accompanied by a photino, the graviton by a gravitino, the electron of a selectron, etc. Following the impossibility to detect a 511 keV boson (the electron partner), the physicists had to re-examine the idea of an exact symmetry. Symmetry is 'broken' and superpartners have a very important mass. One of these superparticules called LSP (Lightest Supersymmetric Particle) is the lightest of all. In most of the supersymmetric theories (without violation of the R-parity) the LSP is a stable particle because it cannot disintegrate in a lighter element. It is of neutral color and electric charge and is then only sensitive to weak interaction (weak nuclear force). It is then an excellent candidate for the not-baryonic dark matter. [11]

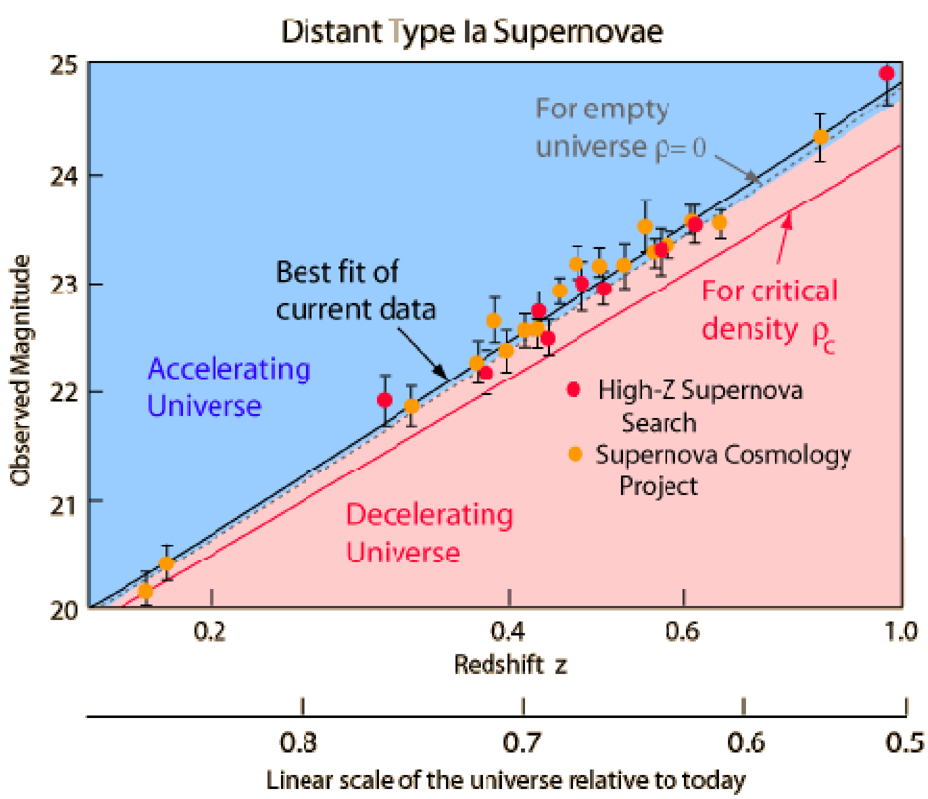
Weakly interacting massive particles

In particle physics and astrophysics, weakly interacting massive particles, or WIMPs, are among the leading hypothetical particle physics candidates for dark matter. The term “WIMP” is given to a dark matter particle that was produced by falling out of thermal equilibrium with the hot dense plasma of the early universe, although it is often used to refer to any dark matter candidate that interacts with standard particles via a force similar in strength to the weak nuclear force. Its name comes from the fact that obtaining the correct abundance of dark matter today via thermal production requires a self-annihilation cross section, which is roughly what is expected for a new particle in the 100 GeV mass range that interacts via the electroweak force. This apparent coincidence is known as the “WIMP miracle”. Because supersymmetric extensions of the standard model of particle physics readily predict a new particle with these properties, a stable supersymmetric partner has long been a prime WIMP candidate. However, recent null results from direct detection experiments including LUX and SuperCDMS, along with the failure to produce evidence of supersymmetry in the Large Hadron Collider (LHC) experiment has cast doubt on the simplest WIMP hypothesis. Experimental efforts to detect WIMPs include the search for products of WIMP annihilation, including gamma rays, neutrinos and cosmic rays in nearby galaxies and galaxy clusters; direct detection experiments designed to measure the collision of WIMPs with nuclei in the laboratory, as well as attempts to directly produce WIMPs in colliders such as the LHC. [10]

Evidence for an accelerating universe

One of the observational foundations for the big bang model of cosmology was the observed expansion of the universe. [9] Measurement of the expansion rate is a critical part of the study, and it has been found that the expansion rate is very nearly "flat". That is, the universe is very close to the critical density, above which it would slow down and collapse inward toward a future "big crunch". One of the great challenges of astronomy and astrophysics is distance measurement over the vast distances of the universe. Since the 1990s it has become apparent that type Ia supernovae offer a unique opportunity for the consistent measurement of distance out to perhaps 1000 Mpc. Measurement at these great distances provided the first data to suggest that the expansion rate of the universe is actually accelerating. That acceleration implies an energy density that acts in opposition to gravity which would cause the expansion to accelerate. This is an energy density which we have not directly detected observationally and it has been given the name "dark energy".

The type Ia supernova evidence for an accelerated universe has been discussed by Perlmutter and the diagram below follows his illustration in Physics Today.



The data summarized in the illustration above involve the measurement of the redshifts of the distant supernovae. The observed magnitudes are plotted against the redshift parameter z. Note that there are a number of Type 1a supernovae around z=.6, which with a Hubble constant of 71 km/s/mpc is a distance of about 5 billion light years.

Equation

The cosmological constant Λ appears in Einstein's field equation [5] in the form of

$$R_{\mu\nu} - \frac{1}{2} R\, g_{\mu\nu} + \Lambda\, g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu},$$

where *R* and *g* describe the structure of spacetime, *T* pertains to matter and energy affecting that structure, and *G* and *c* are conversion factors that arise from using traditional units of measurement. When Λ is zero, this reduces to the original field equation of general relativity. When *T* is zero, the field equation describes empty space (the vacuum).

The cosmological constant has the same effect as an intrinsic energy density of the vacuum, ρ_{vac} (and an associated pressure). In this context it is commonly moved onto the right-hand side of the equation, and defined with a proportionality factor of 8π: $\Lambda = 8\pi\rho_{\text{vac}}$, where unit conventions of general relativity are used (otherwise factors of *G* and *c* would also appear). It is common to quote values of energy density directly, though still using the name "cosmological constant".

A positive vacuum energy density resulting from a cosmological constant implies a negative pressure, and vice versa. If the energy density is positive, the associated negative pressure will drive an accelerated expansion of the universe, as observed. (See dark energy and cosmic inflation for details.)

Explanatory models

Models attempting to explain accelerating expansion include some form of dark energy, dark fluid or phantom energy. The most important property of dark energy is that it has negative pressure which is distributed relatively homogeneously in space. The simplest explanation for dark energy is that it is a cosmological constant or vacuum energy; this leads to the Lambda-CDM model, which is generally known as the Standard Model of Cosmology as of 2003-2013, since it is the simplest model in good agreement with a variety of recent observations.

Dark Matter and Energy

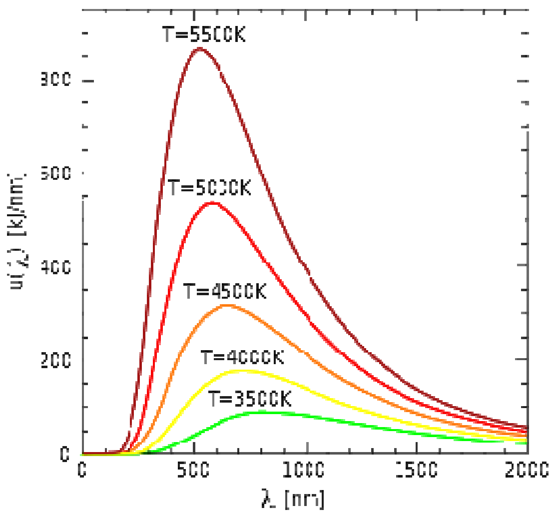
Dark matter is a type of matter hypothesized in astronomy and cosmology to account for a large part of the mass that appears to be missing from the universe. Dark matter cannot be seen directly with telescopes; evidently it neither emits nor absorbs light or other electromagnetic radiation at any significant level. It is otherwise hypothesized to simply be matter that is not reactant to light. Instead, the existence and properties of dark matter are inferred from its gravitational effects on visible matter, radiation, and the large-scale structure of the universe. According to the Planck mission team, and based on the standard model of cosmology, the total mass–energy of the known universe contains 4.9% ordinary matter, 26.8% dark matter and 68.3% dark energy. Thus, dark matter is estimated to constitute 84.5% of the total matter in the universe, while dark energy plus dark matter constitute 95.1% of the total content of the universe. [6]

Cosmic microwave background

The cosmic microwave background (CMB) is the thermal radiation assumed to be left over from the "Big Bang" of cosmology. When the universe cooled enough, protons and electrons combined to form neutral atoms. These atoms could no longer absorb the thermal radiation, and so the universe became transparent instead of being an opaque fog. [7]

Thermal radiation

Thermal radiation is electromagnetic radiation generated by the thermal motion of charged particles in matter. All matter with a temperature greater than absolute zero emits thermal radiation. When the temperature of the body is greater than absolute zero, interatomic collisions cause the kinetic energy of the atoms or molecules to change. This results in charge-acceleration and/or dipole oscillation which produces electromagnetic radiation, and the wide spectrum of radiation reflects the wide spectrum of energies and accelerations that occur even at a single temperature. [8]



Electromagnetic Field and Quantum Theory

Needless to say that the accelerating electrons of the steady stationary current are a simple demystification of the magnetic field, by creating a decreasing charge distribution along the wire, maintaining the decreasing U potential and creating the **A** vector potential experienced by the electrons moving by **v** velocity relative to the wire. This way it is easier to understand also the time dependent changes of the electric current and the electromagnetic waves as the resulting fields moving by c velocity.

It could be possible something very important law of the nature behind the self maintaining **E** accelerating force by the accelerated electrons. The accelerated electrons created electromagnetic fields are so natural that they occur as electromagnetic waves traveling with velocity c. It shows that the electric charges are the result of the electromagnetic waves diffraction.

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. [4]

Lorentz transformation of the Special Relativity

In the referential frame of the accelerating electrons the charge density lowering linearly because of the linearly growing way they takes every next time period. From the referential frame of the wire there is a parabolic charge density lowering.

The difference between these two referential frames, namely the referential frame of the wire and the referential frame of the moving electrons gives the relativistic effect. Important to say that the moving electrons presenting the time coordinate, since the electrons are taking linearly increasing way every next time period, and the wire presenting the geometric coordinate. The Lorentz transformations are based on moving light sources of the Michelson - Morley experiment giving a practical method to transform time and geometric coordinates without explaining the source of this mystery.

The real mystery is that the accelerating charges are maintaining the accelerating force with their charge distribution locally. The resolution of this mystery that the charges are simply the results of the diffraction patterns, that is the charges and the electric field are two sides of the same thing. Otherwise the charges could exceed the velocity of the electromagnetic field.

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 Classical Relativistic effect

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.

Electromagnetic inertia and Gravitational attraction

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.

It looks clear that the growing acceleration results the relativistic growing mass - limited also with the velocity of the electromagnetic wave.

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 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.

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.

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 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. [1]

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.

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 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. [2]

Conclusions

Researchers predict that axions, if they exist, would be produced invisibly by the Sun, but would convert to X-rays as they hit Earth’s magnetic field. This X-ray signal should in theory be strongest when looking through the sunward side of the magnetic field, as this is where the Earth’s magnetic field is strongest. The high frequency of the X-ray and the uncompensated Planck distribution makes the axion a good candidate to be dark matter.

Hidden photons are predicted in some extensions of the Standard Model of particle physics, and unlike WIMPs they would interact electromagnetically with normal matter.
In particle physics and astrophysics, weakly interacting massive particles, or WIMPs, are among the leading hypothetical particle physics candidates for dark matter.
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 electric currents causing self maintaining electric potential is the source of the special and general relativistic effects. The Higgs Field is the result of the electromagnetic induction. The Graviton is two photons together. [3]

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