The Secret of Dark Matter

Invisibility — like time travel, teleportation, flying, and super-speed — has been a fixture in science fiction ever since science fiction has existed. The most well-known examples range from the one used by the Romulans in Star Trek, Harry Potter's deathly hallows cloaking device, and the eleven cloak Frodo and Sam used to evade Sauron's army at the gates of Mordor. There are hundreds, if not thousands, of other mentions in books, movies and television. Over the years, many scientists have come up with inventive ways to hide objects from sight (one includes a 3D printer); only the process is certainly much more complex than science fiction makes it look. [10]

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Scientists Have Found a Way to Interfere With Light to Make Objects Invisible

Before we can get into what a scientific cloak of invisibility is, we must first understand the relationship between light and physical objects. Believe it or not, this relationship is rather simple. For starters, when we look at anything — are it an apple or the car of a passing motorist — what we see boils down to the wavelength of light the object reflects and absorbs.

With, say, the Sun, its white color stems from the fact that it absorbs all wavelengths of light. However, right off the bat, most people would say that the Sun is actually yellow in color (that, however, is a whole other beast). Given this, it's not silly to ask whether it's possible to take measures that will either obscure an object's true color, or perhaps make it invisible altogether.

This scenario isn't nearly as crazy as you might think. In fact, French scientists recently announced they've found a way to manipulate light in such a way that a tiny, opaque object looks entirely transparent to the human eye. While it sounds relatively simple on the surface, things are not entirely what they seem.

How Does It Work?

The technique the researchers used stems from quantum effects. As things like Raleigh scattering have taught us, particles of light live a turbulent life, always smashing into this and that on their journey through spacetime. When they do come in contact with molecules and other particles of matter, their constituent parts, called photons, are sent barreling off in another direction at odd angles. More complications arise when we add additional interacting atoms or molecules into the

equation. Singles in such an environment are referred to as quantum emitters, and they are hugely important in the budding field of quantum technologies.

Now, when one source of light comes in contact with one emitter, it bounces and incites a change in its electromagnetic field, leading to the scattering photons generating even more complex wave patterns. Then, one must take dipoles — or quantum emitters with a positive and a negative side — into account. This feature, which is the result of the emitter having an uneven distribution of electrons, can have a rather large influence on the electromagnetic field. And the electromagnetic field of all emitters in question is important (as phys.org notes, the electromagnetic field experienced by an emitter depends not only on the light beam striking its surface, but also on all of the electromagnetic fields radiated by all of its neighbors, which in turn are affected by the emitter in question).

Ultimately, this often breeds something called dipole-dipole interactions; a combination of things known to scatter light more intensely, and, as these researchers have demonstrated, the effect can also be used to manipulate the way in which light reflects from a surface.
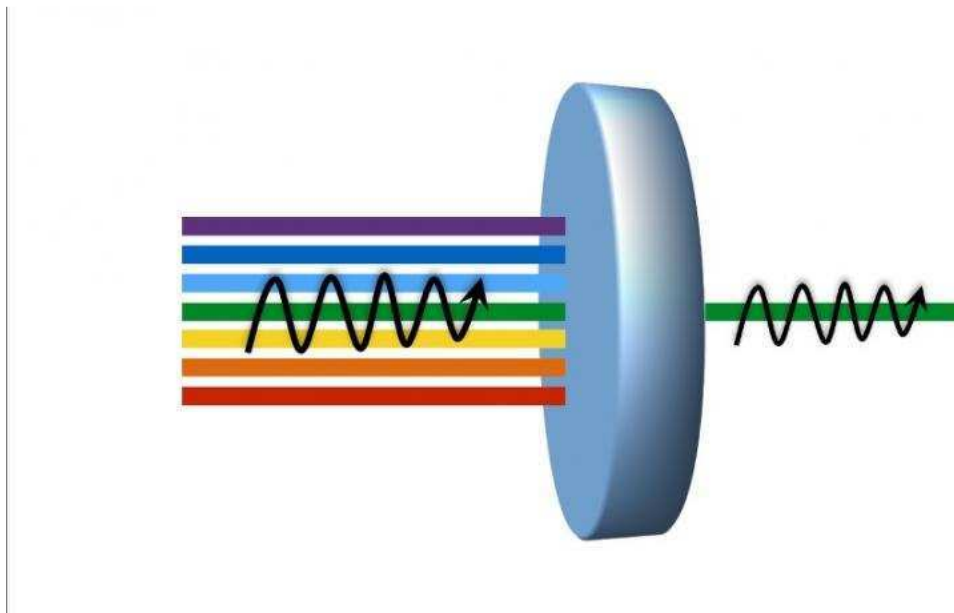
A quantum emitter (represented as the blue disk) interacts with an electromagnetic field. Physicists have learned that dipole-dipole interactions in said quantum emitters can be manipulated to make opaque objects look transparent (Image Credit: Puthumpally-Joseph, et al, American Physical Society)

More specifically, the researchers use a new technique called DIET (dipole-induced electromagnetic transparency) to prevent light from bouncing off a surface, and reflecting back the given wavelength, which essentially make the object transparent at visible wavelengths.

"The significance of our work is in the discovery of a very neat phenomenon (dipole-induced electromagnetic transparency [DIET]), which may be used to control light propagation in optically active media," coauthor Eric Charron, Professor at the University of Paris-Sud in Orsay, France, told Phys.org in October. "We showed how light scattering by a nanometric size system, collectively

responding through strongly coupled two-level atoms/molecules, can be manipulated by altering the material parameters: an otherwise opaque medium can be rendered transparent at any given frequency, by adequately adjusting the relative densities of the atoms/molecules composing it." [10]

What the Future Holds

The catch is that they've yet to replicate their results on an object larger than two atoms across (which is unfathomably small compared to the macro size-scale we are familiar with). However, they believe they are not only well on their way toward making larger molecules essentially invisible, but toward tricking our eyes into believing an object is another color altogether.

Their work also sheds more (proverbial) light on ways we can slow light down drastically, or keep it frozen in place (however, it's worth mentioning that science has already done both successfully). The former is done by altering the path photons take by manipulating the way in which the particles interact with their medium.

The benefits of this breakthrough are far too numerous to state, but clearly, there is more work to do.

"Currently our goal is to hunt for the observation of DIET in multilevel atomic or molecular systems," said Charron. "Each emitter will behave as a series of oscillating dipoles, and this is expected to yield a series of transparency windows, thus opening the way for more elaborate and flexible manipulation strategies. We will publish new results on this topic in Arxiv in the next few weeks. Moreover, DIET offers yet another way to slow the light due to strong anomalous dispersion. We thus plan to develop the study of slow light with DIET in the near future, with potential applications for information processing."

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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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.
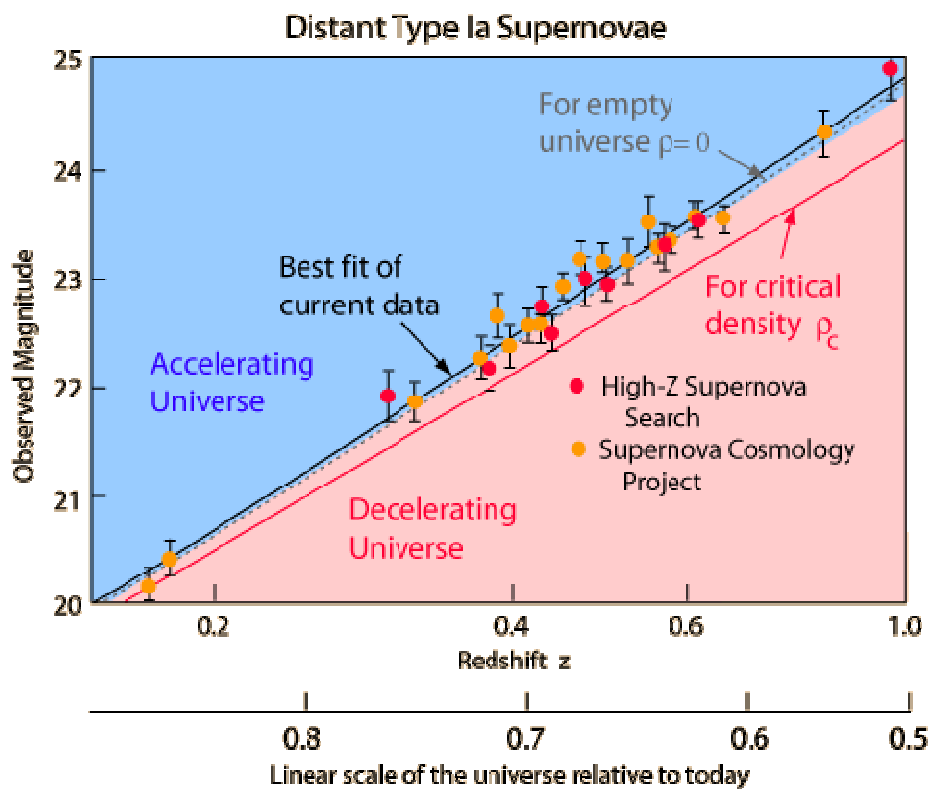
The data summarized in the illustration above involve the measurement of the redshifts of the distant supernovae. The observed magnitudes are plotted against the redshift parameter z. Note that there are a number of Type 1a supernovae around z=.6, which with a Hubble constant of 71 km/s/mpc is a distance 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: $\Lambda = 8\pi\rho_{vac}$, 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]
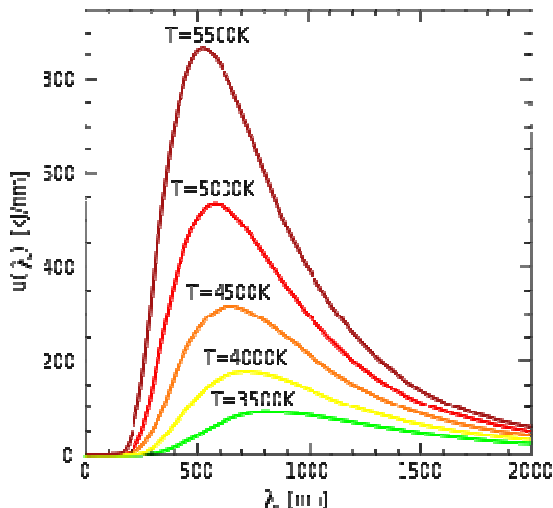
Electromagnetic Field and Quantum Theory

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 $E = h\nu$ 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 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.

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Electromagnetic inertia and mass

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The frequency dependence of mass
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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]

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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 $M_p = 1840 \, M_e$. 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.

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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

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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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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