# Missing Matter of the Universe

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*Astronomers in Germany have developed an artificial intelligence algorithm to help them chart and explain the structure and dynamics of the universe around us with unprecedented accuracy. The team, led by Francisco Kitaura of the Leibniz Institute for Astrophysics in Potsdam, report their results in the journal Monthly Notices of the Royal Astronomical Society. [6]*

*This paper explains the Accelerating Universe, the Special and General Relativity from the observed effects of the accelerating electrons, causing naturally the experienced changes of the electric field potential along the moving electric charges. 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 Relativistic Quantum Theories.*

*The Big Bang caused acceleration created the radial currents of the matter and since the matter 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.*

## Contents

## New Discovery: "The Missing Matter of the Universe's Cosmic Web"

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Galaxies are formed when ordinary matter collapses then cools down. In order to understand the origin of this formation, it was vital to discover in what form and where the ordinary matter that we do not perceive -- known as the 'missing baryons' -- is found. To do this, the astrophysicists from UNIGE and the Ecole polytechnique fédérale de Lausanne (EPFL) took an interest in Abell 2744, a massive cluster of galaxies with a complex distribution of dark and luminous matter at its center.

They observed this cluster with the XMM space telescope, which is capable of detecting the signature of very hot gas due to its sensitivity to X-rays.

Large-scale galaxy surveys have shown that the distribution of ordinary matter in the Universe is not homogeneous. Instead, under the action of gravity, matter is concentrated into filamentary structures, forming a network of knots and links called the 'cosmic web'. The regions experiencing the highest gravitational force collapse and form the knots of the network, such as Abell 2744 shown at top of the page. Comparable to neural networks, these knots then connect to one another through filaments, wherein the researchers identified the presence of gas, and consequently, the missing baryons.

The astrophysicists pointed XMM in the direction of the areas where they suspected to find the presence of filaments, and therefore, the presence of 10-million degree hot gas structures. For the first time, they were able to measure the temperature and density of these objects, and found that they corresponded to the predictions of the numerical models. For this reason, we now have a grasp of the form taken by the missing ordinary matter.

This research is a very significant validation of the models of galaxy formation in the Universe. "Now we must verify that the discovery of Abell 2744's missing baryons is applicable to the entire universe. This will consist in studying these filamentary regions in detail, and measuring their temperature distribution and the various atoms that compose them, in order to understand how many heavy elements there are in the universe," says Dominique Eckert, led scientist. In fact, if the researchers manage to measure the atoms in these filaments, they will be able to estimate the number of heavy nuclei formed by stars since the beginning of the universe. In order to deepen this research, the European Space Agency (ESA) is in the process of developing a new space telescope. Switzerland and the researchers from UNIGE are especially involved in this project. The telescope, named Athena, should be operational in the mid-2020s. [7]

## Using artificial intelligence to chart the universe

Scientists routinely use large telescopes to scan the sky, mapping the coordinates and estimating the distances of hundreds of thousands of galaxies and so enabling them to create a map of the large-scale structure of the Universe. But the distribution that astronomers see is intriguing and hard to explain, with galaxies forming a complex 'cosmic web' showing clusters, filaments connecting them, and large empty regions in between.

The driving force for such a rich structure is gravitation. This force originates from two components; firstly the 5% of the universe that appears to be made of 'normal' matter that makes up the stars, planets, dust and gas we can see and secondly the 23% made up of invisible 'dark' matter. Alongside these some 72% of the cosmos is made up of a mysterious 'dark energy' that rather than exerting a gravitational pull is thought to be responsible for accelerating the expansion of the universe. Together these three constituents are described in the Lambda Cold Dark Matter (LCDM) model for the cosmos, the starting point for the work of the Potsdam team.

Measurements of the residual heat from the Big Bang – the so-called Cosmic Microwave Background Radiation or CMBR emitted 13700 million years ago – allow astronomers to determine the motion of the Local Group, the cluster of galaxies that includes the Milky Way, the galaxy we live in.

Astronomers try to reconcile this motion with that predicted by the distribution of matter around us and its associated gravitational force, but this is compromised by the difficulty of mapping the dark matter in the same region.

"Finding the dark matter distribution corresponding to a galaxy catalogue is like trying to make a geographical map of Europe from a satellite image during the night that only shows the light coming from dense populated areas", says Dr Kitaura.

To try to solve this problem he developed a new algorithm based on artificial intelligence (AI). It starts with the fluctuations in the density of the universe seen in the CMBR, then models the way that matter collapses into today's galaxies over the subsequent 13 billion years. The results of the AI algorithm are a close fit to the observed distribution and motion of galaxies.

Dr Kitaura comments, "Our precise calculations show that the direction of motion and 80% of the speed of the galaxies that make up the Local Group can be explained by the gravitational forces that arise from matter up to 370 million light years away. In comparison the Andromeda Galaxy, the largest member of the Local Group, is a mere 2.5 million light years distant so we are seeing how the distribution of matter at great distances affects galaxies much closer to home.

'Our results are also in close agreement with the predictions of the LCDM model. To explain the rest of the 20% of the speed, we need to consider the influence of matter up to about 460 million light years away, but at the moment the data are less reliable at such a large distance. [6]

## The Big Bang

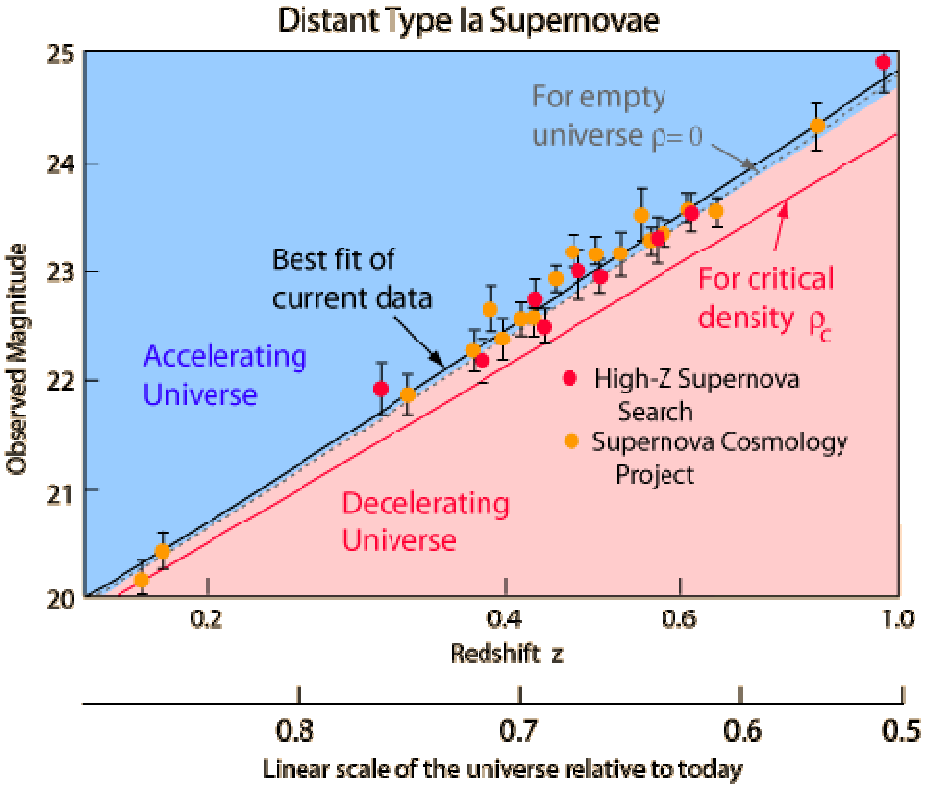
The Big Bang caused acceleration created radial currents of the matter, and since the matter is composed of negative and positive charges, these currents are creating magnetic field and attracting forces between the parallel moving electric currents. This is the gravitational force experienced by the 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.
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.

## Evidence for an accelerating universe

One of the observational foundations for the big bang model of cosmology was the observed expansion of the universe. [4] 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 $\Lambda$ 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, $\rho_{\text{vac}}$ (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 $8\pi$: $\Lambda = 8\pi\rho_{\text{vac}}$, 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.

## 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 $\nu$ 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

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### Relativistic change of mass

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## 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.

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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

In fact, if the researchers manage to measure the atoms in these filaments, they will be able to estimate the number of heavy nuclei formed by stars since the beginning of the universe. In order to deepen this research, the European Space Agency (ESA) is in the process of developing a new space telescope. Switzerland and the researchers from UNIGE are especially involved in this project. The telescope, named Athena, should be operational in the mid-2020s. [7]

Despite this caveat, our model is a big step forward. With the help of AI, we can now model the universe around us with unprecedented accuracy and study how the largest structures in the cosmos came into being." [6]

The accelerating Universe fits into the accelerating charges of the electric currents, because the Bing Bang caused radial moving of the matter.

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.
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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