Newton's Three-Body Problem

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The conditions for life surviving on planets entirely covered in water are more fluid than previously thought, opening up the possibility that water worlds could be habitable, according to a new paper from the University of Chicago and Pennsylvania State University. [12]

Scientists at Rutgers University–New Brunswick and elsewhere are at a crossroads in their 50-year quest to go beyond the Standard Model in physics. [11]

This paper explains the magnetic effect of the electric current from the observed effects of the accelerating electrons, causing naturally the experienced changes of the electric field potential along the electric wire. The accelerating electrons explain not only the Maxwell Equations and the Special Relativity, but the Heisenberg Uncertainty Relation, the wave particle duality and the electron's spin also, building the bridge between the Classical and Quantum Theories.

New ideas for interactions and particles: This paper examines also the possibility to origin the Spontaneously Broken Symmetries from the Planck Distribution Law. This way we get a Unification of the Strong, Electromagnetic, and Weak Interactions from the interference occurrences of oscillators. Understanding that the relativistic mass change is the result of the magnetic induction we arrive to the conclusion that the Gravitational Force is also based on the electromagnetic forces, getting a Unified Relativistic Quantum Theory of all 4 Interactions.

Author: George Rajna

Preface

Surprisingly nobody found strange that by theory the electrons are moving with a constant velocity in the stationary electric current, although there is an accelerating force **F** = **q** **E**, imposed by the **E** electric field along the wire as a result of the **U** potential difference. The accelerated electrons are creating a charge density distribution and maintaining the potential change along the wire. This charge distribution also creates a radial electrostatic field around the wire decreasing along the wire. The moving external electrons in this electrostatic field are experiencing a changing electrostatic field causing exactly the magnetic effect, repelling when moving against the direction of the current and attracting when moving in the direction of the current. This way the **A** magnetic potential is based on the real charge distribution of the electrons caused by their acceleration, maintaining the **E** electric field and the **A** magnetic potential at the same time.

The mysterious property of the matter that the electric potential difference is self-maintained by the accelerating electrons in the electric current gives a clear explanation to the basic sentence of

the relativity that is the velocity of the light is the maximum velocity of the electromagnetic matter. If the charge could move faster than the electromagnetic field, this self-maintaining electromagnetic property of the electric current would be failed.

More importantly the accelerating electrons can explain the magnetic induction also. The changing acceleration of the electrons will create a –**E** electric field by changing the charge distribution, increasing acceleration lowering the charge density and decreasing acceleration causing an increasing charge density.

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. 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.

Researchers crack Newton's elusive three-body problem

It's been nearly 350 years since Sir Isaac Newton outlined the laws of motion, claiming "For every action, there is an equal and opposite reaction." These laws laid the foundation to understand our solar system and, more broadly, to understand the relationship between a body of mass and the forces that act upon it. However, Newton's groundbreaking work also created a pickle that has baffled scientists for centuries: The Three-Body Problem.

After using the laws of motion to describe how planet Earth orbits the sun, Newton assumed that these laws would help us calculate what would happen if a third celestial body, such as the moon, were added to the mix. However, in reality, three-body equations became much more difficult to solve.

When two (or three bodies of different sizes and distances) orbit a center point, it's easy to calculate their movements using Newton's laws of motion. However, if all three objects are of a comparable size and distance from the center point, a power struggle develops and the whole system is thrown into chaos. When chaos happens, it becomes impossible to track the bodies' movements using regular math. Enter the three-body problem.

Now, an international team, led by astrophysicist Dr. Nicholas Stone at the Hebrew University of Jerusalem's Racah Institute of Physics, has taken a big step forward in solving this conundrum. Their findings were published in the latest edition of *Nature*.

Stone and Professor Nathan Leigh at Chile's La Universidad de Concepción relied on discoveries from the past two centuries, namely that unstable three-body systems will eventually expel one of the trio, and form a stable binary relationship between the two remaining bodies. This relationship was the focus of their study.

Instead of accepting the systems' chaotic behavior as an obstacle, the researchers used traditional mathematics to predict the planets' movements. "When we compared our predictions to computer-generated models of their actual movements, we found a high degree of accuracy," shared Stone.

While the researchers stress that their findings do not represent an exact solution to the three-body problem, statistical solutions are still extremely helpful in that they allow physicists to visualize complicated processes.

"Take three black holes that are orbiting one another. Their orbits will necessarily become unstable and even after one of them gets kicked out, we're still very interested in the relationship between the surviving black holes," explained Stone. This ability to predict new orbits is critical to our understanding of how these—and any three-body problem survivors—will behave in a newly-stable situation. [16]

Research group confirm planet-mass objects in extragalactic systems

A University of Oklahoma research group is reporting the detection of extragalactic planet-mass objects in a second and third galaxy beyond the Milky Way after the first detection in 2018. With the existing observational resources, it is impossible to directly detect planet-mass objects beyond the Milky Way and to measure its rogue planetary population.

Members of the group include Xinyu Dai, associate professor in the Homer L. Dodge Department of Physics and Astronomy, OU College of Arts and Sciences, with Ph.D. student Saloni Bhatiani and former postdoctoral researcher Eduardo Guerras.

"The detection of planet-mass objects, either free-floating planets or primordial black holes, are extremely valuable for modeling of star/planet formation or early universe," said Dai. "Even without decomposing the two populations, our limit on the primordial black hole population are already a few orders of magnitude below previous limits in this mass range."

The research group has identified a novel technique that uses quasar microlensing to probe the planet population within distant extragalactic systems. They have been able to constrain the fraction of these planet-mass objects with respect to the galactic halo by studying their microlensing signatures in the spectrum of the lensed images of distant bright Active Galactic Nuclei.

The group surmised these unbound objects to be either free-floating planets or primordial black holes. Free-floating planets were ejected or scattered during stellar/planetary formation. Primordial black holes are formed in the early phase of the universe due to quantum fluctuation. The results are of significant as they confirm that planet-mass objects are indeed universal in galaxies. Moreover, the first-ever constraints at the planet-mass range within the intracluster region of a galaxy cluster are presented here.

The constraints on the primordial mass black holes in the planet mass range are a few orders of magnitude below previous limits.

"We are very excited about the detections in two news systems," said Bhatiani. "We can consistently extract signals from planet mass objects in distant galaxies. This opens a new window in astrophysics."

The observational data used for this work comes from decade-long observations conducted by NASA's Chandra X-ray observatory. The observational evidence for these planet-mass objects was derived from the microlensing signals that appear as shifts in the X-ray emission line of the quasar.

These observational measurements were matched against microlensing simulations that were computed at the OU Supercomputing Center for Education and Research.

Comparison of the research group's models with the observed microlensing rates allowed them to constrain the fraction of these planet-mass objects in the two extragalactic systems about 0.01% of the total mass. This work is a follow-up of the previous research work done by Dai and Guerras that provided the first indirect evidence for the existence of free-floating planets outside the Milky Way.

The two systems are Q J0158-4325 and SDSS J1004+4112. To be able to confirm the existence of planet-mass objects in a galaxy cluster when the universe was half of its current age is quite extraordinary. The group's analysis confirms the existence of these planet-scale objects ranging from Jupiter to Moon mass at extragalactic distances and provides the most stringent constraints at this mass range. These results are in agreement with the current constraints for the unbound planet-mass objects within the Milky Way Galaxy. The results are published in November 2019 issue of the *Astrophysical Journal*. [15]

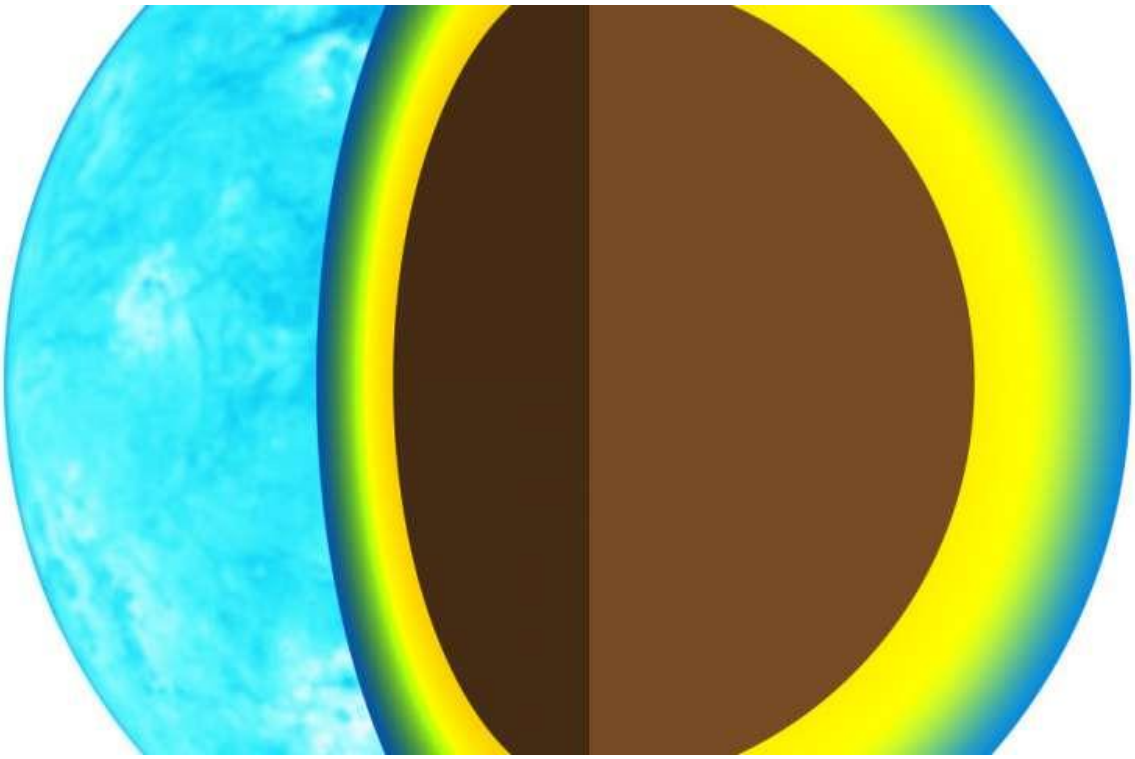
The stuff that planets are made of

UZH researchers have analyzed the composition and structure of faraway exoplanets using statistical tools. Their analysis indicates whether a planet is Earth-like, made up of pure rock, or a water-world. The larger the planet, the more hydrogen and helium surround it.

Is there a second Earth out there in space? The knowledge of extra-solar planetary systems is rising as new technologies sharpen the view of distant objects. To date, 3,700 planets have already been discovered outside the solar system. The planetary masses and radii of these exoplanets can be used to infer their mean density, but not their exact chemical composition and structure. The intriguing question about what these planets could look like is thus still open.

"Theoretically, we can assume various compositions, such as a world of pure water, a world of pure rock, and planets that have hydrogen-helium atmospheres and estimate the radii expected," says Michael Lozovsky, a doctoral candidate in the group of Prof. Ravit Helled at the Institute for Computational Science at the University of Zurich.

Lozovsky and collaborators have used databases and statistical tools to characterize exoplanets and their atmospheres. Exoplanets are fairly common and surrounded by a volatile layer of hydrogen and helium. However, the directly measured data previously didn't allow the researchers to determine the exact structure, since different compositions may lead to the same mass and radius. In addition to the accuracy of the data relating to mass and radius, the research team also investigated the assumed internal structure, temperature and reflected radiation in 83 of the 3,700 known planets for which the masses and radii are well-determined.



Possible model of exoplanets with a rocky core and gaseous atmosphere (artist's impression). Credit: UZH

"We used a statistical analysis to set limits on possible compositions. Using a database of detected exoplanets, we found that every theoretical planetary structure has a 'threshold radius,' a planetary radius above which no planets of this composition exist," explains Michael Lozovsky. The amount of elements in the gaseous layer that are heavier than helium, the percentage of hydrogen and helium, as well as the distribution of elements in the atmosphere are important factors in determining the threshold radius.

Super-Earths and mini-Neptunes

The researchers found that planets with a radius of up to 1.4 times that of Earth (6,371 kilometers) can be Earth-like, i.e., have a composition similar to Earth. Planets with radii above this threshold have a higher share of silicates or other light materials. Most of the planets with a radius above 1.6 radii of the Earth must have a layer of hydrogen-helium gas or water in addition to their rocky core, while those larger than 2.6 Earth radii can't be water worlds and therefore might be surrounded by an atmosphere. Planets with radii larger than four Earth radii are expected to be very gaseous and consist of at least 10 percent hydrogen and helium, similar to Uranus and Neptune.

The findings of the study provide new insights into the development and diversity of these planets. One particularly interesting threshold concerns the difference between large terrestrial planets—otherwise known as super-Earths—and small, gaseous planets, also referred to as mini-Neptunes. According to the researchers, this threshold lies at a radius of three times that of Earth. Below this threshold, it is therefore possible to find earth-like planets in the vast expanse of the galaxy. [14]

Earth's oxygen increased in gradual steps rather than big bursts

A carbon cycle anomaly discovered in carbonate rocks of the Neoproterozoic Hüttenberg Formation of north-eastern Namibia follows a pattern similar to that found right after the Great Oxygenation Event, hinting at new evidence for how Earth's atmosphere became fully oxygenated.

By using the Hüttenberg Formation, which formed between a billion and half a billion years ago, to study the time between Earth's change from an anoxic environment (i.e. one lacking oxygen) to a more hospitable environment that heralded the animal kingdom, a team of researchers led by Dr. Huan Cui of the NASA Astrobiology Institute at the University of Wisconsin–Madison discovered a sustained, high level of carbon. This influx of carbon, coupled with changes in other elements, indicates how changing levels of oceanic oxygen may have lent a helping hand to early animal evolution.

The study, published in the journal Precambrian Research,paired new oxygen, sulfur, and strontium isotope data, with carbon isotope data published in 2009, obtained from drill core samples from the Hüttenberg Formation. Together, the data provides further evidence that Earth's oxygen increased in a stepwise fashion, as opposed to being constrained to two major events capping the Proterozoic (a geological epoch that lasted between 2.5 billion and 541 million years ago). The resulting pattern of changing redox reactions (i.e. reactions involving oxygenation and reduction via the exchange of electrons) was named the Hüttenberg Anomaly, after the rock formation in which it was found.

The University of Maryland's Dr. Alan J. Kaufman, who is the second author of the study and the lead author of the 2009 carbon isotope study, says that the paired data "suggest that the rise of oxygen was oscillatory through this 50- to 75-million year intervalassociated with the Hüttenberg Anomaly and the Neoproterozoic Oxidation Event or NOE at the end of the Proterozoic."

The anomaly shows how the carbon isotope ratios ($^{13}C/^{12}C$) experienced a sustained 12 to 14 parts per thousand increase in abundance for roughly 15 million years before returning to prior low levels. As oxygen levels in the ocean increased, sulfides were converted to sulfates, which some microbes use in their metabolism to digest and recycle organic carbon on the seafloor. The isotopes of oxygen, carbon, and sulfur moved in tandem during the Hüttenberg Anomaly, convincing the scientists that what they were seeing wasn't just a coincidence.

Wild fluctuations

Although it has long been accepted that high levels of atmospheric oxygen paved the way for animals to populate the Earth, global carbon and oxygen cycles fluctuated wildly during the Proterozoic, between the time when oxygen first accumulated in the atmosphere during the Great Oxygenation Event (GOE) around 2.4 billion years ago, and the time in which they stabilized near to modern levels once animals took the world stage following the NOE, around 500 million years ago.

Lead researcher Huan Cui analyzing isotopes in the wet lab at the University of Wisconsin–Madison. Oxygen, carbon, strontium and sulfur isotopes during the Neoproterozoic reveal a step-wise pattern of atmospheric oxygen, crucial to the evolution of complex life. Credit: Huan Cui

During the time between those two events, pulses of unicellular life and variable levels of oxygen in the oceans are thought to have stimulated the evolution of more complex life. These ancient oxygen swings were crucial to the evolution of multicellular life at the Precambrian–Cambrian boundary (541 million years ago; the Cambrian is a geological period that marked the origin and diversification complex animal life on Earth). As pools of oxygenated water grew in the ocean, life was given the opportunity to develop towards a future when oxygen would be at stable and high levels. The Hüttenberg Anomaly represents one such window of opportunity for life.

Kaufman compares the jump in oxygen to another oxygen oasis in time, the Lomagundi event right after the GOE. The Lomagundi event has been described as a false start, when oxygen concentrations rose to levels that could support some life, before decreasing again. It wouldn't be until the NOE that oxygen would rise to modern-day levels.

"Here's an isotope anomaly in the Neoproterozoic that is associated broadly in time with the NOE, but which has a rise and fall structure that looks very similar to the GOE," Kaufman tells Astrobiology Magazine. "At both ends of the Proterozoic Eon there was continental rifting, glaciations, and profound carbon fluctuations; just as the GOE was likely responsible for the evolution of simple eukaryotes, the NOE was involved in the evolution of multicellularity."

So the GOE ushered in eukaryotes, which are microbes with cells containing a nucleus wrapped by a membrane, and the NOE ushered in even more complex animals. These exceptional events in Earth's history each harbored an evolutionary test pool that fostered new lifeforms. How exactly the Hüttenberg Anomaly fits into these events or exactly what evolutionary consequence it had still remains to be seen.

Temporary habitability

During the period between the GOE and the NOE, pockets or bubbles of habitability in a mostly uninhabitable planet would pop up, but these blips on the radar were reversible. Shifting ice sheets or the absence of erosion would decrease elements such as nitrogen and phosphorus required by photosynthesizing life, causing the oxygen and carbon signatures to disappear. The tipping point would appear in the Cambrian Period when the planet was consistently oxygenated.

We see similar effects of anomalies today; in our mostly well-oxygenated atmosphere, there are still oxygen-depleted environments where life struggles to persist or takes an alternative evolutionary pathway: inland seas, underground caves and oceanic dead zones where sulfate- or nitrate-breathers persist while the rest of the world breathes oxygen.

Drill core samples from the Tsumeb mine in the Hüttenberg Formation in north-eastern Namibia. A carbon anomaly found in the samples holds clues as to the early oxygenation of Earth’s oceans. Credit: Huan Cui

"There are still anoxic environments in the modern Earth," Huan Cui, first author of the paper, says. "If you go to the Black Sea, you can still find local anoxic environments in the modern ocean."

In this study the anomaly was oxygen. Today, the anomaly is a lack of oxygen.

While rocks in other areas of Namibia have been well-studied, the rock strata containing the Hüttenberg Anomaly have been eroded out in many sections, leaving the crucial data piece missing for decades.

Taking another look

Dr. Paul Myrow, a geology professor at Colorado College who was not involved with the study, says that given the time constraints this study provides, more researchers will now take a closer look at other ancient rock formations and re-examine whether this anomaly exists elsewhere on the planet.

Parsing out whether the rise in oxygen was restricted or widespread throughout the ancient ocean or on different ancient continents is something every isotopic study has to take into account.

"One of the ways that we can get that answer is to see if the signal of the Hüttenberg Anomaly can be matched to places around the world," Myrow, who also studies Precambrian ocean conditions, says. "If there is this shift that took place in different continents at the same time, then we can be more confident about this being global."

At a time when the planet's oceanic chemistry, tectonic plates and inhabitants were in such a state of disequilibrium, the Earth's low-oxygen and unstable atmosphere could be considered wildly dangerous by today's standards. As the Earth was changing, its teenage awkwardness manifested as smelly, sulfuric pits, hairy living situations, moody shifts in its accommodations, and irreverence towards its co-inhabitants. The Hüttenberg Anomaly is one small step towards the Earth airing out its dirty laundry, cleaning up and becoming presentable for the lifeforms that evolved later. [13]

Water worlds could support life: Analysis challenges idea that life requires 'Earth clone'

The conditions for life surviving on planets entirely covered in water are more fluid than previously thought, opening up the possibility that water worlds could be habitable, according to a new paper from the University of Chicago and Pennsylvania State University.

The scientific community has largely assumed that planets covered in a deep ocean would not support the cycling of minerals and gases that keeps the climate stable on Earth, and thus wouldn't be friendly to life. But the study, published Aug. 30 in The *Astrophysical Journal*, found that ocean planets could stay in the "sweet spot" for habitability much longer than previously assumed. The authors based their findings on more than a thousand simulations.

"This really pushes back against the idea you need an Earth clone—that is, a planet with some land and a shallow ocean," said Edwin Kite, assistant professor of geophysical sciences at UChicago and lead author of the study.

As telescopes get better, scientists are finding more and more planets orbiting stars in other solar systems. Such discoveries are resulting in new research into how life could potentially survive on other planets, some of which are very different from Earth—some may be covered entirely in water hundreds of miles deep.

Because life needs an extended period to evolve, and because the light and heat on planets can change as their stars age, scientists usually look for planets that have both some water and some way to keep their climates stable over time. The primary method we know of is how Earth does it. Over long timescales, our planet cools itself by drawing down greenhouse gases into minerals and warms itself up by releasing them via volcanoes.

But this model doesn't work on a water world, with deep water covering the rock and suppressing volcanoes.

Kite, and Penn State coauthor Eric Ford, wanted to know if there was another way. They set up a simulation with thousands of randomly generated planets, and tracked the evolution of their climates over billions of years.

"The surprise was that many of them stay stable for more than a billion years, just by luck of the draw," Kite said. "Our best guess is that it's on the order of 10 percent of them."

These lucky planets sit in the right location around their stars. They happened to have the right amount of carbon present, and they don't have too many minerals and elements from the crust dissolved in the oceans that would pull carbon out of the atmosphere. They have enough water from the start, and they cycle carbon between the atmosphere and ocean only, which in the right concentrations is sufficient to keep things stable.

"How much time a planet has is basically dependent on carbon dioxide and how it's partitioned between the ocean, atmosphere and rocks in its early years," said Kite. "It does seem there is a way to keep a planet habitable long-term without the geochemical cycling we see on Earth."

The simulations assumed stars that are like our own, but the results are optimistic for red dwarf stars, too, Kite said. Planets in red dwarf systems are thought to be promising candidates for fostering life because these stars get brighter much more slowly than our sun—giving life a much longer time period to get started. The same conditions modeled in this paper could be applied to planets around red dwarfs, they said: Theoretically, all you would need is the steady light of a star. [12]

Physicists at crossroads in trying to understand universe

Scientists at Rutgers University–New Brunswick and elsewhere are at a crossroads in their 50-year quest to go beyond the Standard Model in physics.

Rutgers Today asked professors Sunil Somalwar and Scott Thomas in the Department of Physics and Astronomy at the School of Arts and Sciences to discuss mysteries of the universe. Somalwar's research focuses on experimental elementary particle physics, or high energy physics, which

involves smashing particles together at large particle accelerators such as the one at CERN in Switzerland. Thomas's research focuses on theoretical particle physics.

The duo, who collaborate on experiments, and other Rutgers physicists – including Yuri Gershtein – contributed to the historic 2012 discovery of the Higgs boson, a subatomic particle responsible for the structure of all matter and a key component of the Standard Model.

Rutgers Today: What is the Standard Model?

Thomas: It is a theory started about 50 years ago. It should be called "the most fantastically successful theory of everything ever" because it's a triumph of human intellect. It explains, in a theoretical structure and in great quantitative detail, every single experiment ever done in the laboratory. And no experiment so far conflicts with this theory. The capstone to the Standard Model experimentally was the discovery of the Higgs boson. It predicted the existence and interactions of lots of different particles, all of which were found. The problem is that as theorists, we are victims of our own success. The Standard Model is so successful that the theory does not point to answers to some of the questions we still have. The Higgs boson answered many questions, but we don't get clues directly from this theoretical structure how the remaining questions might be answered, so we're at a crossroads in this 50-year quest. We need some hints from experiments and then, hopefully, the hints will be enough to tell us the next theoretical structure that underlies the Standard Model.

Rutgers Today: What questions remain?

Somalwar: The Standard Model says that matter and antimatter should be nearly equal. But after the Big Bang about 13.8 billion years ago, matter amounted to one part in 10 billion and antimatter dropped to virtually zero. A big mystery is what happened to all the antimatter. And why are neutrinos (also subatomic particles) so light? Is the Higgs boson particle by itself or is there a Higgs zoo? There are good reasons that the Higgs boson could not possibly be alone. There's got to be more to the picture.

Rutgers Today: What are you focusing on?

Somalwar: I am looking for evidence of heavy particles that might have existed a picosecond after the Big Bang. These particles don't exist anymore because they degenerate. They're very unstable. They could explain why neutrinos are so light and why virtually all antimatter disappeared but not all matter disappeared. What we do is called frontier science – it's at the forefront of physics: the smallest distances and highest energies. Once you get to the frontier, you occupy much of the area and start prospecting. But at some point, things are mined out and you need a new frontier. We've just begun prospecting here. We don't have enough mined areas and we may have some gems lying there and more will come in the next year or two. So, it's a very exciting time right now because it's like we've gotten to the gold rush.

Thomas: I am trying to understand the physics underlying the Higgs sector of the Standard Model theory, which must include at least one particle – the Higgs boson. This sector is very important because it determines the size of atoms and the mass of elementary particles. The physics underlying the Higgs sector is a roadblock to understanding physics at a more fundamental scale. Are there other species of Higgs particles? What are their interactions and what properties do they have? That would start to give us clues and then maybe we could reconstruct a theory of what underlies the Standard Model. The real motivation is to understand the way the universe works at its most fundamental level. That's what drives us all. [11]

The Electromagnetic Interaction

Simple Experiment

Everybody can repeat my physics teacher's - Nándor Toth - middle school experiment, placing aluminum folios in form V upside down on the electric wire with static electric current, and seeing them open up measuring the electric potential created by the charge distribution, caused by the acceleration of the electrons.

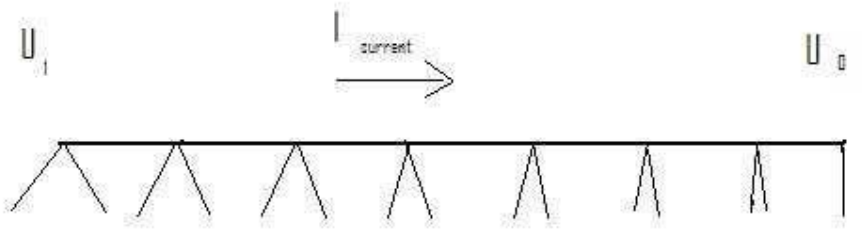


Figure 1.) Aluminium folios shows the charge distribution on the electric wire

He wanted to show us that the potential decreasing linearly along the wire and told us that in the beginning of the wire it is lowering harder, but after that the change is quite linear.

You will see that the folios will draw a parabolic curve showing the charge distribution along the wire, since the way of the accelerated electrons in the wire is proportional with the square of time. The free external charges are moving along the wire, will experience this charge distribution caused electrostatic force and repelled if moving against the direction of the electric current and attracted in the same direction – the magnetic effect of the electric current.

Uniformly accelerated electrons of the steady current

In the steady current **I= dq/dt**, the **q** electric charge crossing the electric wire at any place in the same time is constant. This does not require that the electrons should move with a constant v velocity and does not exclude the possibility that under the constant electric force created by the **E = - dU/dx** potential changes the electrons could accelerate.

If the electrons accelerating under the influence of the electric force, then they would arrive to the **$x = 1/2\ at^2$** in the wire. The **dx/dt = at**, means that every second the accelerating q charge will take a linearly growing length of the wire. For simplicity if a=2 then the electrons would find in the wire at x = 1, 4, 9, 16, 25 …, which means that the dx between them should be 3, 5, 7, 9 …, linearly increasing the volume containing the same q electric charge. It means that the density of the electric charge decreasing linearly and as the consequence of this the U field is decreasing linearly as expected: **-dU/dx = E = const**.

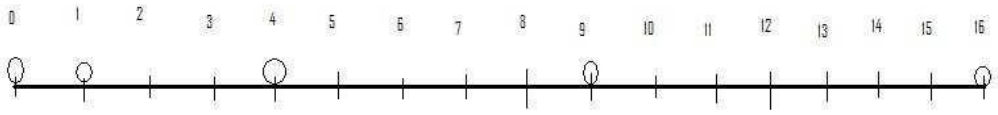


Figure 2.) The accelerating electrons created charge distribution on the electric wire

This picture remembers the Galileo's Slope of the accelerating ball, showed us by the same teacher in the middle school, some lectures before. I want to thank him for his enthusiastic and impressive lectures, giving me the associating idea between the Galileo's Slope and the accelerating charges of the electric current.

We can conclude that the electrons are accelerated by the electric **U** potential, and with this accelerated motion they are maintaining the linear potential decreasing of the **U** potential along they movement. Important to mention, that the linearly decreasing charge density measured in the referential frame of the moving electrons. Along the wire in its referential frame the charge density lowering parabolic, since the charges takes way proportional with the square of time.

The decreasing **U** potential is measurable, simply by measuring it at any place along the wire. One of the simple visualizations is the aluminum foils placed on the wire opening differently depending on the local charge density. The static electricity is changing by parabolic potential giving the equipotential lines for the external moving electrons in the surrounding of the wire.

Magnetic effect of the decreasing U electric potential

One **q** electric charge moving parallel along the wire outside of it with velocity v would experience a changing **U** electric potential along the wire. If it experiencing an emerging potential, it will repel the charge, in case of decreasing **U** potential it will move closer to the wire. This radial electric field will move the external electric charge on the parabolic curve, on the equipotential line of the accelerated charges of the electric current. This is exactly the magnetic effect of the electric current. A constant force, perpendicular to the direction of the movement of the matter will change its direction to a parabolic curve.

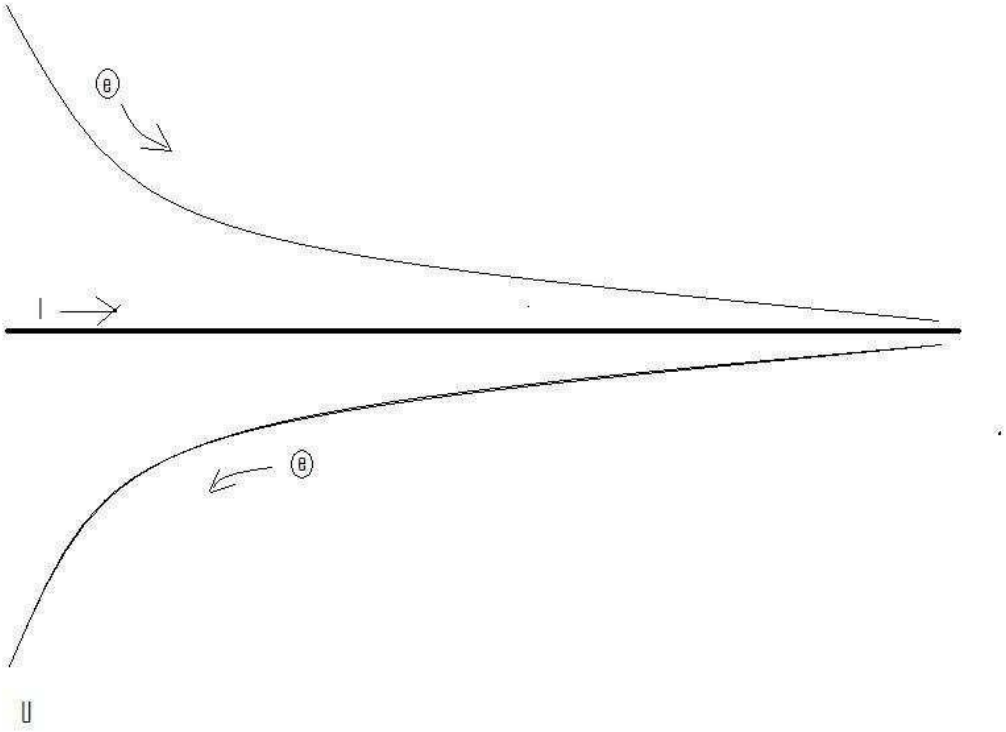


Figure 3.) Concentric parabolic equipotential surfaces around the electric wire causes the magnetic effect on the external moving charges

Considering that the magnetic effect is **F=q v x B**, where the **B** is concentric circle around the electric wire, it is an equipotential circle of the accelerating electrons caused charge distribution. Moving on this circle there is no electric and magnetic effect for the external charges, since **vxB=0**. Moving in the direction of the current the electric charges crosses the biggest potential change, while in any other direction – depending on the angle between the current and velocity of the external charge there is a modest electric potential difference, giving exactly the same force as the **v x B** magnetic force.

Getting the magnetic force from the **F = dp/dt** equation we will understand the magnetic field velocity dependency. Finding the appropriate trajectory of the moving charges we need simply get it from the equipotential lines on the equipotential surfaces, caused by the accelerating charges of the electric current. We can prove that the velocity dependent force causes to move the charges on the equipotential surfaces, since the force due to the potential difference according to the velocity angle – changing only the direction, but not the value of the charge's velocity.

Moving on the parabolic equipotential line gives the same result as the constant force of gravitation moves on a parabolic line with a constant velocity moving body.

Necessary to mention that the **A** magnetic vector potential is proportional with a, the acceleration of the charges in the electric current. Also, the **A** magnetic vector potential gives the radial parabolic electric potential change of the charge distribution due to the acceleration of electric charges in the electric current.

Magnetic induction

Increasing the electric current, I cause increasing magnetic field **B** by increasing the acceleration of the electrons in the wire. If the acceleration of electrons is growing, then the charge density **dQ/dl** will decrease in time, creating a **–E** electric field. Since the resistance of the wire is constant, only increasing U electric potential could cause an increasing electric current **I=U/R=dQ/dt**.

Necessary to mention that decreasing electric current will decrease the acceleration of the electrons, causing increased charge density and **E** positive field.

The electric field is a result of the geometric change of the **U** potential and the timely change of the **A** magnetic potential:

E = - dA/dt - dU/dr

$$\mathbf{B} = \nabla \times \mathbf{A}\,, \quad \mathbf{E} = -\nabla\phi - \frac{\partial \mathbf{A}}{\partial t}\,,$$

The acceleration of the electric charges proportional with the A magnetic vector potential in the electric current and also their time dependence is proportional as well. Since the A vector potential is appears in the equation, the proportional **a** acceleration will satisfy the same equation.

Since increasing acceleration of charges in the increasing electric current the result of increasing potential difference, creating a decreasing potential difference, the electric and magnetic vector potential are changes by the next wave - function equations:

$$\frac{1}{c^2}\frac{\partial^2 \varphi}{\partial t^2} - \nabla^2 \varphi = \frac{\rho}{\varepsilon_0}$$

$$\nabla^2 \mathbf{A} - \frac{1}{c^2}\frac{\partial^2 \mathbf{A}}{\partial t^2} = -\mu_0 \mathbf{J}$$

The simple experiment with periodical changing **U** potential and **I** electric current will move the aluminium folios with a moving wave along the wire.

The Lorentz gauge says exactly that the accelerating charges are self-maintain their accelerator fields and the divergence (source) of the A vector potential is the timely change of the electric potential.

$$\nabla \cdot \vec{A} + \frac{1}{c^2}\frac{\partial \varphi}{\partial t} = 0.$$

Or

$$\vec{E} = -\nabla\, \varphi - \frac{\partial \vec{A}}{\partial t}\,.$$

The timely change of the A vector potential or the changing acceleration of the charges will produce a negative electric field.

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 take 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.

The ether problem resolution is the matter as diffraction patterns of the electromagnetic oscillations. Also, the accelerating charges (matter) maintaining the accelerating force with linearly changing potential is the secret of the relativity. Because of this the Michelson-Morley experiment doesn't show an existence of the ether, the electromagnetic oscillations always create diffraction patterns, electrodynamics' matter, functioning as the ether. [1]

The Relativistic Quantum Mechanics

The same thing happens on the atomic scale giving a dp impulse difference and a dx way difference between the different part of the not point like particles.

Commonly accepted idea that the relativistic effect on the particle physics it is the fermions' spin - another unresolved problem in the classical concepts. If the electric charges can move only with accelerated motions in the self-maintaining electromagnetic field, once upon a time they would reach the velocity of the electromagnetic field. The resolution of this problem is the spinning

particle, constantly accelerating and not reaching the velocity of light because the acceleration is radial.

Heisenberg Uncertainty Relation

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

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

Wave – Particle Duality

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

Atomic model

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

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

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.

Asymmetry in the interference occurrences of oscillators

The asymmetrical configurations are stable objects of the real physical world, because they cannot annihilate. One of the most obvious asymmetry is the proton – electron mass rate $M_p = 1840\ M_e$ while they have equal charge. We explain this fact by the strong interaction of the proton, but how remember it his strong interaction ability for example in the H – atom where are only electromagnetic interactions among proton and electron.

This gives us the idea to origin the mass of proton from the electromagnetic interactions by the way interference occurrences of oscillators. The uncertainty relation of Heisenberg makes sure that the particles are oscillating.

The resultant intensity due to n equally spaced oscillators, all of equal amplitude but different from one another in phase, either because they are driven differently in phase or because we are looking at them an angle such that there is a difference in time delay:

(1) $I = I_0 \sin^2 n\,\varphi/2 \,/\, \sin^2 \varphi/2$

If φ is infinitesimal so that $\sin\varphi = \varphi$ than

(2) $I = n^2 I_0$

This gives us the idea of

(3) $M_p = n^2 M_e$

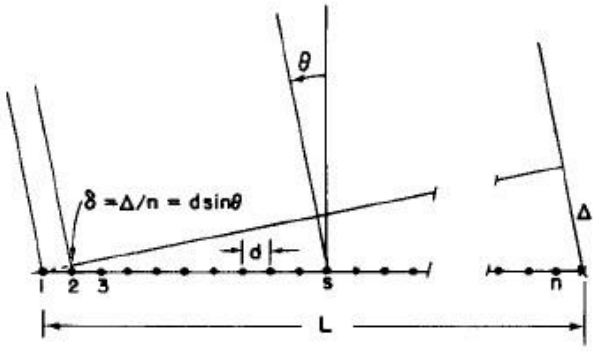


Fig. 30–3. A linear array of n equal oscillators, driven with phases $\alpha_s = s\alpha$.

Figure 1.) A linear array of n equal oscillators

There is an important feature about formula (1) which is that if the angle φ is increased by the multiple of 2π it makes no difference to the formula.

So

(4) d sin θ = m λ and we get m-order beam if λ less than d. [6]

If d less than λ we get only zero-order one centered at θ = 0. Of course, there is also a beam in the opposite direction. The right chooses of d and λ we can ensure the conservation of charge.

For example

(5) 2 (m+1) = n

Where 2(m+1) = N_p number of protons and n = N_e number of electrons.

In this way we can see the H_2 molecules so that 2n electrons of n radiate to 4(m+1) protons, because $d_e > \lambda_e$ for electrons, while the two protons of one H_2 molecule radiate to two electrons of them, because of $d_e < \lambda_e$ for these two protons.

To support this idea, we can turn to the Planck distribution law, that is equal with the Bose – Einstein statistics.

Spontaneously broken symmetry in the Planck distribution law

The Planck distribution law is temperature dependent and it should be true locally and globally. I think that Einstein's energy-matter equivalence means some kind of existence of electromagnetic

oscillations enabled by the temperature, creating the different matter formulas, atoms molecules, crystals, dark matter and energy.

Max Planck found for the black body radiation

As a function of wavelength (λ), Planck's law is written as:

$$B_\lambda(T) = \frac{2hc^2}{\lambda^5} \frac{1}{e^{\frac{hc}{\lambda k_B T}} - 1}.$$

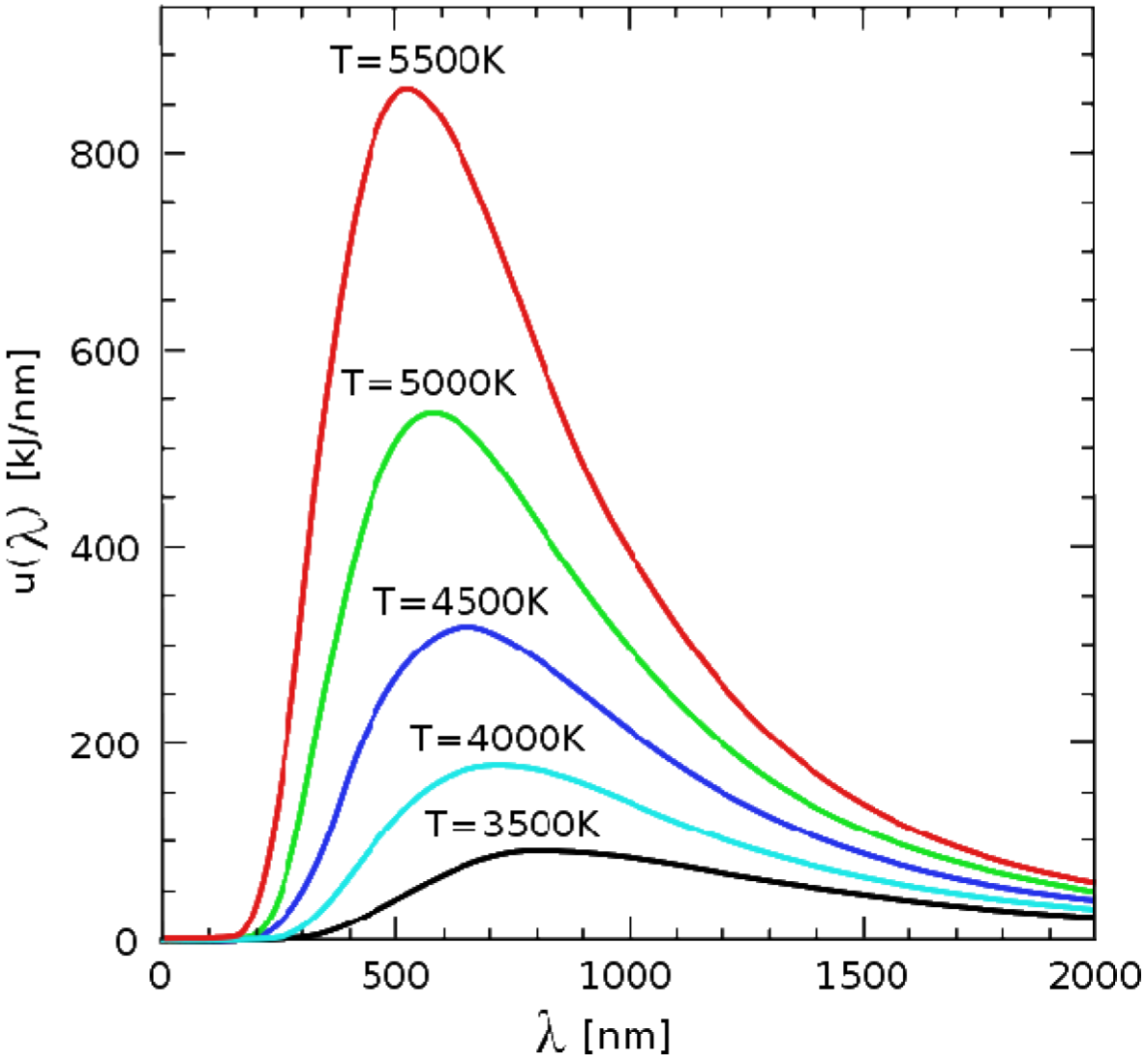


Figure 2. The distribution law for different T temperatures

We see there are two different λ_1 and λ_2 for each T and intensity, so we can find between them a d so that $\lambda_1 < d < \lambda_2$.

We have many possibilities for such asymmetrical reflections, so we have many stable oscillator configurations for any T temperature with equal exchange of intensity by radiation. All of these

configurations can exist together. At the λ_{max} is the annihilation point where the configurations are symmetrical. The λ_{max} is changing by the Wien's displacement law in many textbooks.

(7) $$\lambda_{\max} = \frac{b}{T}$$

where $\lambda_{\max}$ is the peak wavelength, T is the absolute temperature of the black body, and b is a constant of proportionality called *Wien's displacement constant*, equal to $2.8977685(51)\times10^{-3}$ m·K (2002 CODATA recommended value).

By the changing of T the asymmetrical configurations are changing too.

The structure of the proton

We must move to the higher T temperature if we want look into the nucleus or nucleon arrive to $d<10^{-13}$ cm. If an electron with $\lambda_e < d$ move across the proton then by (5) 2 (m+1) = n with m = 0 we get n = 2 so we need two particles with negative and two particles with positive charges. If the proton can fraction to three parts, two with positive and one with negative charges, then the reflection of oscillators is right. Because this very strange reflection where one part of the proton with the electron together on the same side of the reflection, the all parts of the proton must be quasi lepton so $d > \lambda_q$. One way dividing the proton to three parts is, dividing his oscillation by the three directions of the space. We can order 1/3 e charge to each coordinate and 2/3 e charge to one plane oscillation, because the charge is scalar. In this way the proton has two +2/3 e plane oscillation and one linear oscillation with -1/3 e charge. The colors of quarks are coming from the three directions of coordinates and the proton is colorless. The flavors of quarks are the possible oscillations differently by energy and if they are plane or linear oscillations. We know there is no possible reflecting two oscillations to each other which are completely orthogonal, so the quarks never can be free, however there is an asymptotic freedom while their energy are increasing to turn them to the orthogonally. If they will be completely orthogonal then they lose this reflection and take new partners from the vacuum. Keeping the symmetry of the vacuum, the new oscillations are keeping all the conservation laws, like charge, number of baryons and leptons. The all features of gluons are coming from this model. The mathematics of reflecting oscillators show Fermi statistics.

Important to mention that in the Deuteron there are 3 quarks of +2/3 and -1/3 charge, that is three u and d quarks making the complete symmetry and because this its high stability.

The Pauli Exclusion Principle says that the diffraction points are exclusive!

The Strong Interaction

Confinement and Asymptotic Freedom

For any theory to provide a successful description of strong interactions it should simultaneously exhibit the phenomena of confinement at large distances and asymptotic freedom at short

distances. Lattice calculations support the hypothesis that for non-abelian gauge theories the two domains are analytically connected, and confinement and asymptotic freedom coexist.
Similarly, one way to show that QCD is the correct theory of strong interactions is that the coupling extracted at various scales (using experimental data or lattice simulations) is unique in the sense that its variation with scale is given by the renormalization group. [4]
Lattice QCD gives the same results as the diffraction theory of the electromagnetic oscillators, which is the explanation of the strong force and the quark confinement. [1]

The weak interaction

The weak interaction transforms an electric charge in the diffraction pattern from one side to the other side, causing an electric dipole momentum change, which violates the CP and time reversal symmetry.

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

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

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

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

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

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

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

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

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

The General Weak Interaction

The Weak Interactions T-asymmetry is in conjunction with the T-asymmetry of the Second Law of

Thermodynamics, meaning that locally lowering entropy (on extremely high temperature) causes for example the Hydrogen fusion. The arrow of time by the Second Law of Thermodynamics shows the increasing entropy and decreasing information by the Weak Interaction, changing the temperature dependent diffraction patterns. A good example of this is the neutron decay, creating more particles with less known information about them.

The neutrino oscillation of the Weak Interaction shows that it is a general electric dipole change and it is possible to any other temperature dependent entropy and information changing diffraction pattern of atoms, molecules and even complicated biological living structures.

We can generalize the weak interaction on all of the decaying matter constructions, even on the biological too. This gives the limited lifetime for the biological constructions also by the arrow of time. There should be a new research space of the Quantum Information Science the 'general neutrino oscillation' for the greater then subatomic matter structures as an electric dipole change.

There is also connection between statistical physics and evolutionary biology, since the arrow of time is working in the biological evolution also.

The Fluctuation Theorem says that there is a probability that entropy will flow in a direction opposite to that dictated by the Second Law of Thermodynamics. In this case the Information is growing that is the matter formulas are emerging from the chaos. So the Weak Interaction has two directions, samples for one direction is the Neutron decay, and Hydrogen fusion is the opposite direction. [5]

Fermions and Bosons

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

The Higgs boson or Higgs particle is a proposed elementary particle in the Standard Model of particle physics. The Higgs boson's existence would have profound importance in particle physics because it would prove the existence of the hypothetical Higgs field - the simplest of several proposed explanations for the origin of the symmetry-breaking mechanism by which elementary particles gain mass. [3]

The fermions' spin

The moving charges are accelerating, since only this way can self-maintain the electric field causing their acceleration. The electric charge is not point like! This constant acceleration possible if there is a rotating movement changing the direction of the velocity. This way it can accelerate forever without increasing the absolute value of the velocity in the dimension of the time and not reaching the velocity of the light.

The Heisenberg uncertainty relation says that the minimum uncertainty is the value of the spin: 1/2 h = d x d p or 1/2 h = d t d E, that is the value of the basic energy status.

What are the consequences of this in the weak interaction and how possible that the neutrinos' velocity greater than the speed of light?

The neutrino is the one and only particle doesn't participate in the electromagnetic interactions so we cannot expect that the velocity of the electromagnetic wave will give it any kind of limit.

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

The source of the Maxwell equations

The electrons are accelerating also in a static electric current because of the electric force, caused by the potential difference. The magnetic field is the result of this acceleration, as you can see in [2].

The mysterious property of the matter that the electric potential difference is self-maintained by the accelerating electrons in the electric current gives a clear explanation to the basic sentence of the relativity that is the velocity of the light is the maximum velocity of the matter. If the charge could move faster than the electromagnetic field than this self-maintaining electromagnetic property of the electric current would be failed.

Also, an interesting question, how the changing magnetic field creates a negative electric field? The answer also the accelerating electrons will give. When the magnetic field is increasing in time by increasing the electric current, then the acceleration of the electrons will increase, decreasing the charge density and creating a negative electric force. Decreasing the magnetic field by decreasing the electric current will decrease the acceleration of the electrons in the electric current and increases the charge density, creating an electric force also working against the change. In this

way we have explanation to all interactions between the electric and magnetic forces described in the Maxwell equations.
The second mystery of the matter is the mass. We have seen that the acceleration change of the electrons in the flowing current causing a negative electrostatic force. This is the cause of the relativistic effect - built-in in the Maxwell equations - that is the mass of the electron growing with its acceleration and its velocity never can reach the velocity of light, because of this growing negative electrostatic force. The velocity of light is depending only on 2 parameters: the magnetic permeability and the electric permittivity.
There is a possibility of the polarization effect created by electromagnetic forces creates the negative and positive charges. In case of equal mass as in the electron-positron pair it is simply, but on higher energies can be asymmetric as the electron-proton pair of neutron decay by week interaction and can be understood by the Feynman graphs.
Anyway, the mass can be electromagnetic energy exceptionally and since the inertial and gravitational mass are equals, the gravitational force is electromagnetic force and since only the magnetic force is attractive between the same charges, is very important for understanding the gravitational force.

The Uncertainty Relations of Heisenberg gives the answer, since only this way can be sure that the particles are oscillating in some way by the electromagnetic field with constant energies in the atom indefinitely. Also, not by chance that the uncertainty measure is equal to the fermions spin, which is one of the most important feature of the particles. There are no singularities, because the moving electron in the atom accelerating in the electric field of the proton, causing a charge distribution on delta x position difference and with a delta p momentum difference such a way that they product is about the half Planck reduced constant. For the proton this delta x much less in the nucleon, than in the orbit of the electron in the atom, the delta p is much higher because of the greatest proton mass.

The Special Relativity

The mysterious property of the matter that the electric potential difference is self-maintained by the accelerating electrons in the electric current gives a clear explanation to the basic sentence of the relativity that is the velocity of the light is the maximum velocity of the matter. If the charge could move faster than the electromagnetic field than this self-maintaining electromagnetic property of the electric current would be failed. [8]

The Heisenberg Uncertainty Principle

Moving faster needs stronger acceleration reducing the dx and raising the dp. It means also mass increasing since the negative effect of the magnetic induction, also a relativistic effect!

The Uncertainty Principle also explains the proton – electron mass rate since the dx is much less requiring bigger dp in the case of the proton, which is partly the result of a bigger mass m_p because of the higher electromagnetic induction of the bigger frequency (impulse).

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.

The Gravitational force

The changing magnetic field of the changing current causes electromagnetic mass change by the negative electric field caused by the changing acceleration of the electric charge.

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.

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

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

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

Gluons are elementary particles that act as the exchange particles (or gauge bosons) for the strong force between quarks, analogous to the exchange of photons in the electromagnetic force between two charged particles. [10]

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. [1]

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 attract 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]

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 center of mass. A spin zero particle like the Higgs carries no directional information away from the original collision so the distribution will be even in all directions. This test will be possible when a

much larger number of events have been observed. In the mean time we can settle for less certain indirect indicators.

The Casimir effect

The Casimir effect is related to the Zero-point energy, which is fundamentally related to the Heisenberg uncertainty relation. The Heisenberg uncertainty relation says that the minimum uncertainty is the value of the spin: 1/2 h = dx dp or 1/2 h = dt dE, that is the value of the basic energy status.

The moving charges are accelerating, since only this way can self-maintain the electric field causing their acceleration. The electric charge is not point like! This constant acceleration possible if there is a rotating movement changing the direction of the velocity. This way it can accelerate forever without increasing the absolute value of the velocity in the dimension of the time and not reaching the velocity of the light. In the atomic scale the Heisenberg uncertainty relation gives the same result, since the moving electron in the atom accelerating in the electric field of the proton, causing a charge distribution on delta x position difference and with a delta p momentum difference such a way that they product is about the half Planck reduced constant. For the proton this delta x much less in the nucleon, than in the orbit of the electron in the atom, the delta p is much higher because of the greater proton mass. This means that the electron is not a point like particle, but has a real charge distribution.

Electric charge and electromagnetic waves are two sides of the same thing; the electric charge is the diffraction center of the electromagnetic waves, quantified by the Planck constant h.

The Fine structure constant

The Planck constant was first described as the proportionality constant between the energy (*E*) of a photon and the frequency (*ν*) of its associated electromagnetic wave. This relation between the energy and frequency is called the **Planck relation** or the **Planck–Einstein equation**:

$$E = h\nu\,.$$

Since the frequency ν, wavelength λ, and speed of light c are related by $\lambda\nu = c$, the Planck relation can also be expressed as

$$E = \frac{hc}{\lambda}.$$

Since this is the source of Planck constant, the e electric charge countable from the Fine structure constant. This also related to the Heisenberg uncertainty relation, saying that the mass of the proton should be bigger than the electron mass because of the difference between their wavelengths.

The expression of the fine-structure constant becomes the abbreviated

$$\alpha = \frac{e^2}{\hbar c}$$

This is a dimensionless constant expression, 1/137 commonly appearing in physics literature.

This means that the electric charge is a result of the electromagnetic waves diffractions, consequently the proton – electron mass rate is the result of the equal intensity of the corresponding electromagnetic frequencies in the Planck distribution law, described in my diffraction theory.

Electromagnetic wave equation

The electromagnetic wave equation is a second-order partial differential equation that describes the propagation of electromagnetic waves through a medium or in a vacuum. It is a three-dimensional form of the wave equation. The homogeneous form of the equation, written in terms of either the electric field E or the magnetic field B, takes the form:

$$\left(c^2\nabla^2 - \frac{\partial^2}{\partial t^2}\right)\mathbf{E} = \mathbf{0}$$

$$\left(c^2\nabla^2 - \frac{\partial^2}{\partial t^2}\right)\mathbf{B} = \mathbf{0}$$

where

$$c = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$$

is the speed of light in a medium with permeability (μ_0), and permittivity (ε_0), and ∇^2 is the Laplace operator. In a vacuum, c = 299,792,458 meters per second, which is the speed of light in free space. [1]

The electromagnetic wave equation derives from Maxwell's equations. It should also be noted that in most older literature, B is called the magnetic flux density or magnetic induction. [9]

Since $E=mc^2$, it is clear that the mass is dependent only on the electromagnetic constants, giving one more evidence that the gravitational force has an electromagnetic origin.

Path integral formulation of Quantum Mechanics

The path integral formulation of quantum mechanics is a description of quantum theory which generalizes the action principle of classical mechanics. It replaces the classical notion of a single, unique trajectory for a system with a sum, or functional integral, over an infinity of possible trajectories to compute a quantum amplitude. [7]

It shows that the particles are diffraction patterns of the electromagnetic waves.

Conclusions

The magnetic induction creates a negative electric field, causing an electromagnetic inertia responsible for the relativistic mass change; it is the mysterious Higgs Field giving mass to the

particles. The Planck Distribution Law of the electromagnetic oscillators explains the electron/proton mass rate by the diffraction patterns. The accelerating charges 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 self-maintained electric potential of the accelerating charges equivalent with the General Relativity space-time curvature, and since it is true on the quantum level also, gives the base of the Quantum Gravity. The 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.

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