

# Viruses don't have Metabolism

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*A research team led by physicist Roya Zandi at the University of California, Riverside, has made progress in solving this mystery. [9]*

*A protein involved in cognition and storing long-term memories looks and acts like a protein from viruses. [8]*

*Discovery of quantum vibrations in 'microtubules' inside brain neurons supports controversial theory of consciousness*

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*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.*

*The Planck Distribution Law of the electromagnetic oscillators explains the electron/proton mass ratio and the Weak and Strong Interactions by the diffraction patterns. The Weak Interaction changes the diffraction patterns by moving the electric charge from one side to the other side of the diffraction pattern, which violates the CP and Time reversal symmetry.*

*The diffraction patterns and the locality of the self-maintaining electromagnetic potential explains also the Quantum Entanglement, giving it as a natural part of the Relativistic Quantum Theory and making possible to understand the Quantum Biology.*

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## Preface

The human body is a constant flux of thousands of chemical/biological interactions and processes connecting molecules, cells, organs, and fluids, throughout the brain, body, and nervous system. Up until recently it was thought that all these interactions operated in a linear sequence, passing on information much like a runner passing the baton to the next runner. However, the latest findings in quantum biology and biophysics have discovered that there is in fact a tremendous degree of coherence within all living systems. [5]

Quantum entanglement is a physical phenomenon that occurs when pairs or groups of particles are generated or interact in ways such that the quantum state of each particle cannot be described independently – instead, a quantum state may be given for the system as a whole. [4]

I think that we have a simple bridge between the classical and quantum mechanics by understanding the Heisenberg Uncertainty Relations. It makes clear that the particles are not point like but have a  $dx$  and  $dp$  uncertainty.

## Viruses don't have a metabolism; but some have the building blocks for one

In satellite photos of the Earth, clouds of bright green bloom across the surface of lakes and oceans as algae populations explode in nutrient-rich water. From the air, the algae appear to be the primary players in the ecological drama unfolding below.

But those [single-celled organisms](#) we credit for influencing the aquatic environment at the base of the food chain may be under the influence of something else: [viruses](#) whose [genes](#) can reconfigure their hosts' metabolism.

In a new study published in *Nature Communications*, a research team from Virginia Tech reported that they had found a substantial collection of genes for metabolic cycles—a defining characteristic of cellular life—in a wide range of "[giant viruses](#)."

Giant viruses disrupt the familiar narrative about viruses: That they're the tiniest denizens of the microbiome, little more than a stripped-down husk of an organism—just a few genes' worth of DNA or RNA folded into a shell so small you need an electron microscope to see it. In fact, the giant viruses, ten times the size of their more compact cousins and with hundreds or even thousands of genes, are so unlike the rest of the family that when the first species was discovered in 1992, researchers dismissed it as bacteria.

They were eventually correctly classified, but even then considered an isolated curiosity. Frank Aylward, an assistant professor of biological sciences in the College of Science, who led the research, explained that routine surveys of viral diversity often missed them for a prosaic reason: They're so big that they get caught in the filters researchers use to separate viruses from bacteria and other larger organisms.

But gradually, it became clear that these oversized viruses were everywhere—and especially plentiful in [aquatic environments](#), where they infect single-celled organisms like algae and protozoans. That's important, because the metabolism of those comparatively complex organisms—what nutrients they consume, what waste they produce—heavily influences the health of the oceans and lakes they live in, and ultimately the planet's carbon cycle.

"They're all over the biosphere. It's just we haven't really paid attention to them," Aylward said.

Aylward started paying attention after postdoctoral researcher Monir Moniruzzaman, the lead author of the new study, joined the lab in 2018.

"Monir is the giant [virus](#) expert," Aylward laughed. "He just wouldn't stop talking about giant viruses, so finally I said, okay, we'll start working on them."

Working from publicly available metagenome databases, which house jumbles of genetic data from the vast array of organisms in a variety of environments, Moniruzzaman began to tease out genomes that belonged to giant viruses. Using known giant-virus genes as markers and patterns in the data as clues, he pieced together genomes for 501 giant viruses, mostly from marine and freshwater environments. Those genomes contained the standard features you'd expect—genes that direct the construction of the virus' protective shell, and that allow it to infect and kill its host.

They didn't expect to see so many metabolic genes. Metabolism, the collection of processes cells use to extract energy from nutrients, is a hallmark of cellular life, absent from viruses almost by definition. Nevertheless, these giant viruses seemed to have genes linked to several key metabolic pathways in living cells.

These weren't the first metabolic genes that had turned up in viral genomes, but they included many functions that had never been seen in viruses. Other examples had been isolated viral genes that were virtually identical to their cellular counterparts, suggesting they had been acquired from the host by chance during an infection and pasted into the virus' genome relatively recently: vestigial artifacts of invasions past rather than functional tools.

The genes Moniruzzaman and Aylward found, on the other hand, comprised large portions of familiar metabolic pathways but had their own unique signature.

"It implies that the viruses have had these genes for millions of years, even billions of years, and they're virus-specific metabolic genes," Aylward explained.

That suggests that these genes aren't just genetic flotsam, but working components the virus deploys as it commandeers its host. In this case, the researchers say, the implication is that the virus is altering the cell's metabolism.

"Once viruses infect a cell, we can't think of the cell as being its own autonomous entity anymore," Aylward says. "The fundamental aspects of cellular physiology are being rewired by these viruses upon infection."

Changes in the host's metabolism can shift the balance of nutrients being consumed and released into the environment, giving viruses sway over aquatic biogeochemistry. Even though viruses aren't

alive, Aylward explains, "they are significantly altering the course of life every day in the environment."

The next step is figuring out how by using experimental studies that can help uncover how these genes function and interact with the host's native metabolism. The team will also probe the evolution of these genes to determine how they slipped into the viral genome, and when.

Discovering these genes, which stretch our ideas about how giant viruses influence their environment, has broader implications for virology. Finding the building blocks for metabolism in something that's not alive blurs the distinction between what's alive and what isn't.

"I think of these Venn diagrams, where it used to be that there was very little overlap, and the more we learn, the more they continue to overlap," Aylward said. "Now it's gotten to the point where there are actually very few genes that are only found in cells, and very few genes that are only found in viruses. In terms of the genomic repertoires, they have much more in common than we would actually expect."

Moniruzzaman suspects that there are more surprises lurking in these genomes, which are stuffed with what he describes as "viral dark matter"—genes that keep surfacing in studies of giant viruses but whose functions are still unknown.

"Don't you think they're fascinating? I just think they're fascinating," Moniruzzaman marvels. "They're just a bag of mystery. They're like a big forest and you are standing in front of the forest and you don't know what's in it. And I think this is the right time to understand it. I think they're mysterious, that's what I think." [10]

## How a virus forms its symmetric shells

Viruses—small disease-causing parasites that can infect all types of life forms—have been well studied, but many mysteries linger. One such mystery is how a spherical virus circumvents energy barriers to form symmetric shells.

A research team led by physicist Roya Zandi at the University of California, Riverside, has made progress in solving this mystery. The team reports in a paper published in *ACS Nano* that an interplay of energies at the molecular level makes the formation of a shell possible.

Understanding the factors that contribute to viral assembly could enable biomedical attempts to block [viral replication](#) and infection. A better understanding of how viral shells—nature's nano-containers—form is of vital importance to material scientists and a crucial step in the design of engineered nano-shells that could serve as vehicles for delivering drugs to specific targets in the body.

Zandi's team explored the role of protein concentration and [elastic energy](#) in the self-organization of proteins on the curved shell surface to understand how a [virus](#) circumvents many energy barriers.

"Understanding the combined effect of elastic energy, genome-protein interaction, and protein concentration in the viral assembly constitutes the breakthrough of our work," said Zandi, a professor in the Department of Physics and Astronomy. "Our study shows that if a messy shell forms because of the high protein concentration or strong attractive interaction, then, as the shell grows larger, the cost of elastic energy becomes so high that several bonds can get broken, resulting in the disassembly and subsequent reassembly of a symmetric shell."

### What is a virus?

The simplest physical object in biology, a virus consists of a protein shell called the capsid, which protects its nucleic acid genome—RNA or DNA. Viruses can be thought of as mobile containers of RNA or DNA that insert their genetic material into living cells. They then take over the cells' reproductive machinery to reproduce their own genome and capsid.

Capsid formation is one of the most crucial steps in the process of viral infection. The capsid can be cylindrical or conical in shape, but more commonly it assumes an [icosahedral structure](#), like a soccer ball.

An [icosahedron](#) is a geometrical structure with 12 vertices, 20 faces, and 30 sides. An official [soccer ball](#) is a kind of icosahedron called a truncated icosahedron; it has 32 panels cut into the shape of 20 hexagons and 12 pentagons, with the pentagons separated from each other by hexagons.

Viral assembly is not well understood because viruses are very small, measuring in nanometers, a nanometer being one-billionth of a meter. The assembly also happens very quickly, typically in milliseconds, a millisecond being one-thousandth of a second. Theoretical work and simulations are necessary to understand how a virus grows.

"A viral [shell](#) is highly symmetric," Zandi said. "If one pentagonal defect forms in the wrong location, it breaks down the symmetry. Despite this sensitivity, viral shells are often assembled into well-defined symmetric structures."

### Nano vehicles

Zandi explained that due to a lack of experimental data, the virus assembly process is not well understood. The new work found the elastic properties of [capsid](#) proteins and the attractive interaction between them go hand in hand to form highly symmetric configurations that are energetically very stable.

"By fine-tuning these parameters, we can control the final structure and stability of viral capsids," she said. "These viral capsids can be used as nano-containers for transporting drugs as cargo to specific targets. What makes them highly promising for [drug delivery](#) and gene delivery purposes is that they are stable, have a high uptake efficiency, and have low toxicity."

Already, some experimental groups are working with pharmaceutical companies to design drugs that interfere or block [viral assembly](#). Her lab is working with international collaborators to design simulations to better understand virus assembly.

"Understanding the factors that affect the stability of the final viral structures can make drug delivery processes more controllable," she said. [9]

### **Surprise: A virus-like protein is important for cognition and memory**

A protein involved in cognition and storing long-term memories looks and acts like a protein from viruses. The protein, called Arc, has properties similar to those that viruses use for infecting host cells, and originated from a chance evolutionary event that occurred hundreds of millions of years ago.

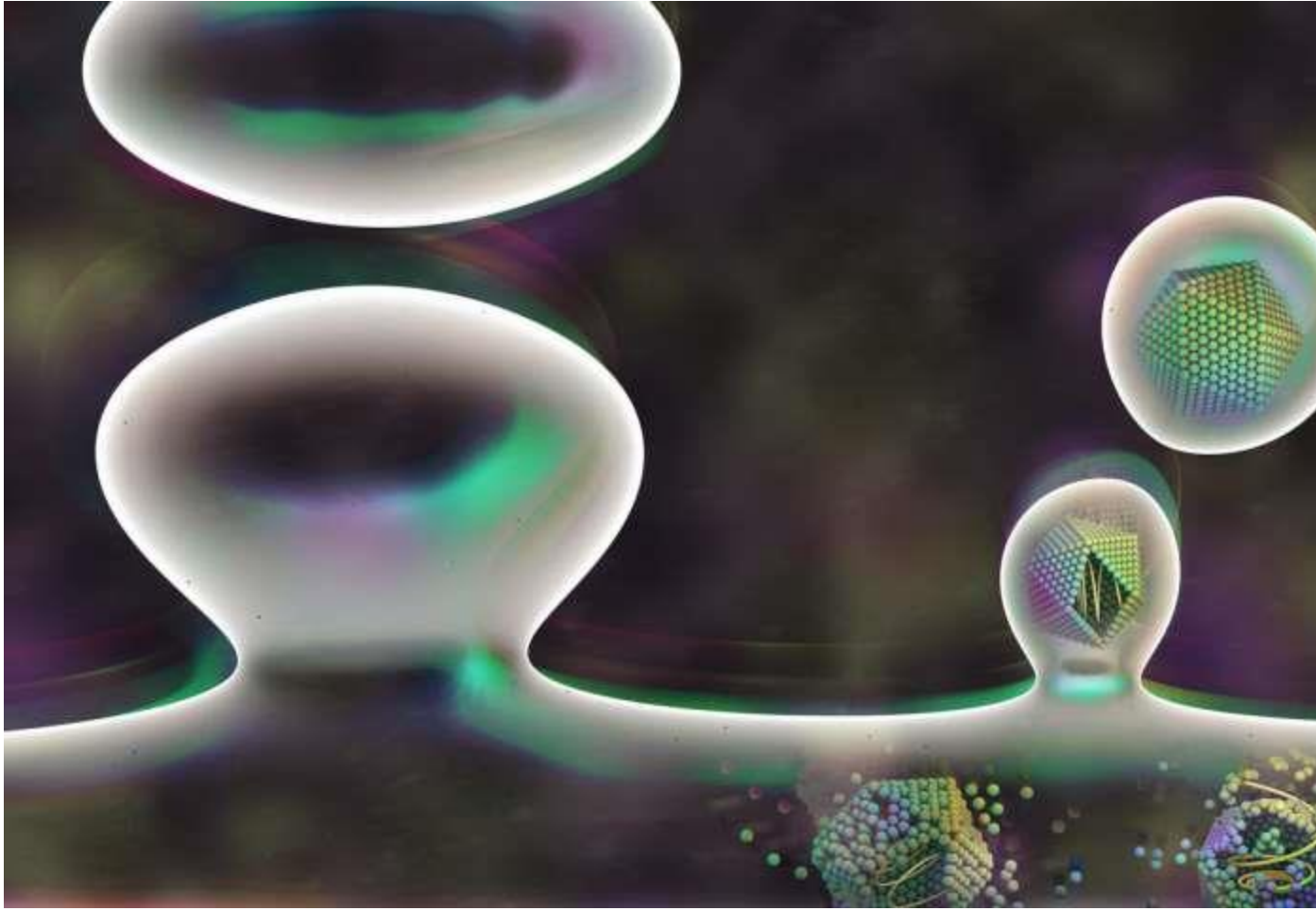
The prospect that virus-like proteins could be the basis for a novel form of cell-to-cell communication in the brain could change our understanding of how memories are made, according to Jason Shepherd, Ph.D., a neuroscientist at University of Utah Health and senior author of the study publishing in *Cell* on Jan. 11.

Shepherd first suspected that something was different about Arc when his colleagues captured an image of the protein showing that Arc was assembling into large structures. With a shape that resembles a capsule from a lunar lander, these structures looked a lot like the retrovirus, HIV.

"At the time, we didn't know much about the molecular function or evolutionary history of Arc," says Shepherd who has researched the protein for 15 years. "I had almost lost interest in the protein, to be honest. After seeing the capsids, we knew we were onto something interesting."

The gap in research was not for want of an interesting subject. Prior work had shown that mice lacking Arc forgot things they had learned a mere 24 hours earlier. Further, their brains lacked plasticity. There is a window of time early in life when the brain is like a sponge, easily soaking up new knowledge and skills. Without Arc, the window never opens.

Scientists had never considered that mechanisms responsible for acquiring knowledge could stem from foreign origins. Now, the work by Shepherd and his team has raised this intriguing possibility.



A protein important for cognition and memory named Arc can encapsulate genetic material (polyhedron enveloping the ribbon-like strands) and deliver it to brain cells in a manner similar to the way in which viruses infect host cells. Credit: Chris Manfre

### **Everything Old is New Again**

Seeing Arc's unusual propensity to form virus-like structures prompted Shepherd to scrutinize the protein sequence with a new set of eyes. He found that regions of the code were similar to that from viral capsids. An essential tool for viral infection, capsids carry virus' genetic information and deliver it from cell to cell in its victim.

Given that Arc looks like a viral protein, Shepherd and his colleagues designed a set of experiments to test whether it also acts like one. They first determined that several copies of Arc self-assemble into hollow virus-like capsids and stash its own genetic material, in this case mRNA, inside them. When the scientists added the capsids to mouse brain cells, or neurons, growing in a dish, Arc transferred its genetic cargo into the cells.

After viruses invade host cells, they emerge ready to infect once again. It appears that Arc works in a similar way. The scientists gathered Arc that had been released from mouse neurons and determined that the proteins and their cargo could be taken up by another set of neurons. Unlike for viruses, activating neurons mobilizes Arc, triggering the release of capsids.



"We went into this line of research knowing that Arc was special in many ways, but when we discovered that Arc was able to mediate cell-to-cell transport of RNA, we were floored," says the study's lead author, postdoctoral fellow Elissa Pastuzyn, Ph.D. "No other non-viral protein that we know of acts in this way."

### When Lightning Strikes Twice

The story of Arc's origin is relayed through the genomes of animals throughout evolutionary time. 350-400 million years ago, a chance occurrence struck four-limbed creatures that roamed the earth. An ancestor to retroviruses, called retrotransposons, inserted its genetic material into the animals' DNA. The event led to the mammalian Arc that we know today.

The significance of such an event is hinted at by the fact that it happened more than once. An accompanying paper in the same issue of Cell shows that a version of Arc found in flies also looks and acts like a viral capsid. Vivian Budnik's lab at the University of Massachusetts shows that fly Arc transports RNA from neurons to muscles to control movement. Even though mammalian and fly Arc evolved from the same class of retrotransposons, the event in flies occurred about 150 million years later.

"As an evolutionary biologist this is what is the most exciting to me," says co-author Cédric Feschotte, Ph.D. a professor at Cornell University. "The fact that it happened at least twice makes us think that it happened even more."

Shepherd believes this could mean that it is advantageous to have this viral-inspired system in place, and it may represent a novel form of intercellular communication. This hypothesis remains to be tested in mammals. "Knowing what cargo Arc vesicles transport in living animals will be critical to understanding the function of this pathway," he says.

Remember the unusual viral-like protein that you just learned about? It could be controlling your memory. [8]

### COULD QUANTUM CONSCIOUSNESS EXIST?

Despite all the research we've done, we still know relatively little about how the human brain works, and we know even less about the mystery of "consciousness." Scientists disagree about whether consciousness exists at all outside the illusions of our own collective imagination. Some believe it exists independently although we've yet to understand its origins have brought quantum physics into the discussion.

This is probably in part because of the way that the "observer effect" challenged one of science's most basic tenets: that there is an objective, observable reality that exists whether we're looking at it or not. The revelation that observing and measuring quantum effects changes their behavior is troubling, but it also suggests to many people that consciousness itself is part of quantum theory. Moreover, as humans creating AI that, for all its achievements still can't master some of the things that come so easily to our own minds (at least not yet), we are bound to see a blurry reflection of ourselves in quantum computers, which promise to achieve so much more than ordinary computers ever could.

However, it was the British physicist [Roger Penrose who pointed out](#) that, observer effect aside, [quantum mechanics](#) may be involved in consciousness. More specifically, he thought it might be possible that quantum events cause molecular structures in the brain to alter their state and trigger neurons in different ways; that literal quantum effects within the brain exist.

For all we can accomplish with the human brain, it has its foibles, and perhaps suspecting the existence of quantum consciousness is one of them. We possess superior intellects because of our [high-level pattern processing](#) abilities, but it is also a well-proven fact that the human brain is prone to [see meaningful patterns](#) where none exist; in the midst of meaningless noise. And while the study of quantum physics is certainly not meaningless noise, it's possible that our minds — which are [meaning making machines](#) — are wrong to see themselves in quantum effects. Does it really make sense to think that our lack of understanding of both consciousness and quantum mechanics [points to a larger connection](#)?

## OUR PARTICIPATORY UNIVERSE

There is more to this question than the raw interest of philosophy: if there is in fact a connection between quantum mechanics and human consciousness, any major breakthrough in our understanding of either could help us understand both. For example, advances in quantum computing could enable us to master [brain augmentation](#) and uploading consciousness, opening the door to a form of immortality. Improved understanding of the superposition property could teach us how to conquer multiple mutually-exclusive ideas at once.

Or, perhaps we've been approaching this in the wrong way. As we look at quantum mechanics, we ask ourselves whether we disturb the effects by measuring, or whether it is the act of noticing the measurement impacting our consciousness that causes the disturbance. Is it possible that knowing how to think in the right way—achieving a quantum consciousness—will allow us to perceive quantum mechanics properly for the first time? We've always been part of Wheeler's [participatory universe](#) in some sense, lending our interpretation to what reality is as we record our own history.

For now, most of the scientific community regards quantum effects in the brain skeptically—an appropriate response at this point. Fueling the fast retreat from any quantum consciousness theories in the scientific community is the New Age quantum consciousness trend and the cottage industry arising from it with plenty of avid bloggers writing about things like telepathy, the afterlife, and telekinesis, and crafters [selling art](#) and other products.

Whether or not consciousness influences quantum mechanics, and whether or not we eventually require quantum theory to fully comprehend how the brain works, for now we can enjoy the useful discomfort the association provides. Quantum theory has forced us out of our collective comfort zone as we consider new ways of thinking, and found ourselves living inside our own theories. [7]

## Quantum Consciousness

A review and update of a controversial 20-year-old theory of consciousness published in Physics of Life Reviews claims that consciousness derives from deeper level, finer scale activities inside brain neurons. The recent discovery of quantum vibrations in "microtubules" inside brain neurons

corroborates this theory, according to review authors Stuart Hameroff and Sir Roger Penrose. They suggest that EEG rhythms (brain waves) also derive from deeper level microtubule vibrations, and that from a practical standpoint, treating brain microtubule vibrations could benefit a host of mental, neurological, and cognitive conditions. [6]

Extensive scientific investigation has found that a form of quantum coherence operates within living biological systems through what is known as biological excitations and biophoton emission. What this means is that metabolic energy is stored as a form of electromechanical and electromagnetic excitations. These coherent excitations are considered responsible for generating and maintaining long-range order via the transformation of energy and very weak electromagnetic signals. After nearly twenty years of experimental research, Fritz-Albert Popp put forward the hypothesis that biophotons are emitted from a coherent electrodynamics field within the living system.

What this means is that each living cell is giving off, or resonating, a biophoton field of coherent energy. If each cell is emitting this field, then the whole living system is, in effect, a resonating field—a ubiquitous nonlocal field. And since biophotons are the entities through which the living system communicates, there is near-instantaneous intercommunication throughout. And this, claims Popp, is the basis for coherent biological organization -- referred to as quantum coherence. This discovery led Popp to state that the capacity for evolution rests not on aggressive struggle and rivalry but on the capacity for communication and cooperation. In this sense the built-in capacity for species evolution is not based on the individual but rather living systems that are interlinked within a coherent whole: Living systems are thus neither the subjects alone, nor objects isolated, but both subjects and objects in a mutually communicating universe of meaning. . . . Just as the cells in an organism take on different tasks for the whole, different populations enfold information not only for themselves, but for all other organisms, expanding the consciousness of the whole, while at the same time becoming more and more aware of this collective consciousness.

Biophysicist Mae-Wan Ho describes how the living organism, including the human body, is coordinated throughout and is "coherent beyond our wildest dreams." It appears that every part of our body is "in communication with every other part through a dynamic, tunable, responsive, liquid crystalline medium that pervades the whole body, from organs and tissues to the interior of every cell."

What this tells us is that the medium of our bodies is a form of liquid crystal, an ideal transmitter of communication, resonance, and coherence. These relatively new developments in biophysics have discovered that all biological organisms are constituted of a liquid crystalline medium. Further, DNA is a liquid-crystal, lattice-type structure (which some refer to as a liquid crystal gel), whereby body cells are involved in a holographic instantaneous communication via the emitting of biophotons (a source based on light). This implies that all living biological organisms continuously

emit radiations of light that form a field of coherence and communication. Moreover, biophysics has discovered that living organisms are permeated by quantum wave forms. [5]

## Quantum Entanglement

Measurements of physical properties such as position, momentum, spin, polarization, etc. performed on entangled particles are found to be appropriately correlated. For example, if a pair of particles is generated in such a way that their total spin is known to be zero, and one particle is found to have clockwise spin on a certain axis, then the spin of the other particle, measured on the same axis, will be found to be counterclockwise. Because of the nature of quantum measurement, however, this behavior gives rise to effects that can appear paradoxical: any measurement of a property of a particle can be seen as acting on that particle (e.g. by collapsing a number of superimposed states); and in the case of entangled particles, such action must be on the entangled system as a whole. It thus appears that one particle of an entangled pair "knows" what measurement has been performed on the other, and with what outcome, even though there is no known means for such information to be communicated between the particles, which at the time of measurement may be separated by arbitrarily large distances. [4]

## The Bridge

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. [1]

## Accelerating charges

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 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.

## Relativistic effect

Another bridge between the classical and quantum mechanics in the realm of relativity is that the charge distribution is lowering in the reference frame of the accelerating charges linearly:  $ds/dt = at$  (time coordinate), but in the reference frame of the current it is parabolic:  $s = a/2 t^2$  (geometric coordinate).

## 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 its 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.

## The Relativistic Bridge

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. One origin of the Quantum Physics is the Planck Distribution Law of the electromagnetic oscillators, giving equal intensity for 2 different wavelengths on any temperature. Any of these two wavelengths will give equal intensity diffraction patterns, building different asymmetric constructions, for example proton - electron structures (atoms), molecules, etc. Since the particles are centers of diffraction patterns they also have particle – wave duality as the electromagnetic waves have. [2]

## 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. The Electroweak Interaction shows that the Weak Interaction is basically

electromagnetic in nature. The arrow of time shows the entropy grows by changing the temperature dependent diffraction patterns of the electromagnetic oscillators.

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  $1/2$  spin creator particle to make equal the spins of the weak interaction, for example neutron decay to 2 fermions, every particle is fermions with  $1/2$  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  $\frac{1}{2}$  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 than 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.

### **Fermions and Bosons**

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

### **Van Der Waals force**

Named after the Dutch scientist Johannes Diderik van der Waals – who first proposed it in 1873 to explain the behaviour of gases – it is a very weak force that only becomes relevant when atoms and molecules are very close together. Fluctuations in the electronic cloud of an atom mean that it will have an instantaneous dipole moment. This can induce a dipole moment in a nearby atom, the result being an attractive dipole–dipole interaction.

## Electromagnetic inertia and mass

### Electromagnetic Induction

Since the magnetic induction creates a negative electric field as a result of the changing acceleration, it works as an electromagnetic inertia, causing an electromagnetic mass. [1]

### Relativistic change of mass

The increasing mass of the electric charges the result of the increasing inductive electric force acting against the accelerating force. The decreasing mass of the decreasing acceleration is the result of the inductive electric force acting against the decreasing force. This is the relativistic mass change explanation, especially importantly explaining the mass reduction in case of velocity decrease.

### The frequency dependence of mass

Since  $E = h\nu$  and  $E = mc^2$ ,  $m = h\nu/c^2$  that is the  $m$  depends only on the  $\nu$  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  $m_0$  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. [2]

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  $M_p=1840 M_e$ . 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.

The Big Bang caused acceleration created radial currents of the matter, and since the matter is composed of negative and positive charges, these currents are creating magnetic field and attracting forces between the parallel moving electric currents. This is the gravitational force experienced by the matter, and also the mass is result of the electromagnetic forces between the charged particles. The positive and negative charged currents attracts each other or by the magnetic forces or by the much stronger electrostatic forces!?

The gravitational force attracting the matter, causing concentration of the matter in a small space and leaving much space with low matter concentration: dark matter and energy. There is an asymmetry between the mass of the electric charges, for example proton and electron, can understood by the asymmetrical Planck Distribution Law. This temperature dependent energy distribution is asymmetric around the maximum intensity, where the annihilation of matter and antimatter is a high probability event. The asymmetric sides are creating different frequencies of electromagnetic radiations being in the same intensity level and compensating each other. One of these compensating ratios is the electron – proton mass ratio. The lower energy side has no compensating intensity level, it is the dark energy and the corresponding matter is the dark matter.

## The Higgs boson

By March 2013, the particle had been proven to behave, interact and decay in many of the expected ways predicted by the Standard Model, and was also tentatively confirmed to have + parity and zero spin, two fundamental criteria of a Higgs boson, making it also the first known scalar particle to be discovered in nature, although a number of other properties were not fully proven and some partial results do not yet precisely match those expected; in some cases data is also still awaited or being analyzed.

Since the Higgs boson is necessary to the W and Z bosons, the dipole change of the Weak interaction and the change in the magnetic effect caused gravitation must be conducted. The Wien law is also important to explain the Weak interaction, since it describes the  $T_{max}$  change and the diffraction patterns change. [2]

## Higgs mechanism and Quantum Gravity

The magnetic induction creates a negative electric field, causing an electromagnetic inertia. Probably it is the mysterious Higgs field giving mass to the charged particles? We can think about the photon as an electron-positron pair, they have mass. The neutral particles are built from negative and positive charges, for example the neutron, decaying to proton and electron. The wave – particle duality makes sure that the particles are oscillating and creating magnetic induction as an inertial mass, explaining also the relativistic mass change. Higher frequency creates stronger magnetic induction, smaller frequency results lesser magnetic induction. It seems to me that the magnetic induction is the secret of the Higgs field.

In particle physics, the Higgs mechanism is a kind of mass generation mechanism, a process that gives mass to elementary particles. According to this theory, particles gain mass by interacting with the Higgs field that permeates all space. More precisely, the Higgs mechanism endows gauge bosons in a gauge theory with mass through absorption of Nambu–Goldstone bosons arising in spontaneous symmetry breaking.

The simplest implementation of the mechanism adds an extra Higgs field to the gauge theory. The spontaneous symmetry breaking of the underlying local symmetry triggers conversion of components of this Higgs field to Goldstone bosons which interact with (at least some of) the other fields in the theory, so as to produce mass terms for (at least some of) the gauge bosons. This mechanism may also leave behind elementary scalar (spin-0) particles, known as Higgs bosons.

In the Standard Model, the phrase "Higgs mechanism" refers specifically to the generation of masses for the  $W^\pm$ , and Z weak gauge bosons through electroweak symmetry breaking. The Large Hadron Collider at CERN announced results consistent with the Higgs particle on July 4, 2012 but stressed that further testing is needed to confirm the Standard Model.

## What is the Spin?

So we know already that the new particle has spin zero or spin two and we could tell which one if we could detect the polarizations of the photons produced. Unfortunately this is difficult and neither ATLAS nor CMS are able to measure polarizations. The only direct and sure way to confirm that the particle is indeed a scalar is to plot the angular distribution of the photons in the rest frame of the centre of mass. A spin zero particles like the Higgs carries no directional information away from the original collision so the distribution will be even in all directions. This test will be possible when a much larger number of events have been observed. In the mean time we can settle for less certain indirect indicators.

## 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]

## Conclusions

Discovery of quantum vibrations in 'microtubules' inside brain neurons supports controversial theory of consciousness. [6]

These relatively new developments in biophysics have discovered that all biological organisms are constituted of a liquid crystalline medium. Further, DNA is a liquid-crystal, lattice-type structure (which some refer to as a liquid crystal gel), whereby body cells are involved in a holographic instantaneous communication via the emitting of biophotons (a source based on light). This implies that all living biological organisms continuously emit radiations of light that form a field of coherence and communication. Moreover, biophysics has discovered that living organisms are permeated by quantum wave forms. [5]

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 their movement. The accelerated charges self-maintaining potential shows the locality of the relativity, working on the quantum level also. [1]

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. The Secret of Quantum Entanglement that the particles are diffraction patterns of the electromagnetic waves and this way their quantum states every time is the result of the quantum state of the intermediate electromagnetic waves. [2]

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 also.

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