Neuromorphic Computing Device

A team of researchers with members from France, Japan and the U.S. has created a nanoscale magnetic device that mimics the behavior of neurons and can be used to recognize human audio signals. [10]

In the field of neuromorphic engineering, researchers study computing techniques that could someday mimic human cognition. Electrical engineers at the Georgia Institute of Technology recently published a "roadmap" that details innovative analog-based techniques that could make it possible to build a practical neuromorphic computer. [9]

How does the brain - a lump of 'pinkish gray meat' - produce the richness of conscious experience, or any subjective experience at all? Scientists and philosophers have historically likened the brain to contemporary information technology, from the ancient Greeks comparing memory to a 'seal ring in wax,' to the 19th century brain as a 'telegraph switching circuit,' to Freud's sub-conscious desires 'boiling over like a steam engine,' to a hologram, and finally, the computer. [8]

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

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.

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 rate 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.

Contents

Preface 3

Nanoscale magnetic device mimics behavior of neurons and can recognize human audio signals 3

Neuromorphic computing 'roadmap' envisions analog path to simulating human brain 4

Is Your Brain Really a Computer, or Is It a Quantum Orchestra? 6

Quantum Consciousness 7

Consciousness as a State of Matter 8

Quantum Entanglement 9

The Bridge 9

Accelerating charges 9

Relativistic effect 9

Heisenberg Uncertainty Relation 10

Wave – Particle Duality 10

Atomic model 10

The Relativistic Bridge 10

The weak interaction 11

The General Weak Interaction 12

Fermions and Bosons 12

Van Der Waals force 12

Electromagnetic inertia and mass 12

Electromagnetic Induction 12

Relativistic change of mass 13

The frequency dependence of mass 13

Electron – Proton mass rate 13

Gravity from the point of view of quantum physics 13

The Gravitational force 13

The Higgs boson 14

Higgs mechanism and Quantum Gravity 14

What is the Spin? 15

The Graviton 15

Conclusions 15

References 16

Author: George Rajna

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.

Nanoscale magnetic device mimics behavior of neurons and can recognize human audio signals

A team of researchers with members from France, Japan and the U.S. has created a nanoscale magnetic device that mimics the behavior of neurons and can be used to recognize human audio signals. In their paper published in the journal Nature, the team describes how they built their device, how it works and how accurate they found its results. Frank Hoppensteadt with the Courant Institute of Mathematical Sciences offers a News & Views piece on the work done by the team and outlines the ideas behind neuromorphic (brain-like) computers and how some of them are being created.

As their name implies, neuromorphic computers are computing devices that work by mimicking the way the human brain works—in such systems, researchers create devices meant to mimic neurons, synapses, etc. In this new effort, the researchers built such a device and used it to recognize human audio signals. Notably, such devices are typically analog rather than digital and are expected to offer some advantages over traditional computers (reduced energy need, trainability and higher data transfer speeds) if they can be developed. In this new effort, the researchers built a nanoscale neuromorphic computer with 400 neurons arranged in an array and placed on a computer chip.

The neurons were represented by tiny three-layer pillars—a non-magnetic spacer between two ferromagnetic layers. A continuous electric current induced direct magnetization at the top of the neuron, and a secondary current caused the magnetization to oscillate in a stable way. To use the array as a computing device, the researchers spoke a single-digit number such as "one" aloud into a

microphone, which fed the sound to a digital processor that converted it to an electrical signal. The electrical signal was then fed to the neuron-mimicking chip, which the researchers referred to as a reservoir. Another digital computer read the oscillations of the neurons, analyzed them, and then to translated the result to a human-recognizable form, such as displaying the word "one" on a video screen. In testing the device with multiple voices, the team found it to be 99.6 percent accurate.

The device is clearly rudimentary, and was built purely for research purposes, but it does demonstrate that neuromorphic computers are more than simple flights of fancy—they may very well augment future computers, offering new ways to process information. [10]

Neuromorphic computing 'roadmap' envisions analog path to simulating human brain

A core technological hurdle in this field involves the electrical power requirements of computing hardware. Although a human brain functions on a mere 20 watts of electrical energy, a digital computer that could approximate human cognitive abilities would require tens of thousands of integrated circuits (chips) and a hundred thousand watts of electricity or more – levels that exceed practical limits.

The Georgia Tech roadmap proposes a solution based on analog computing techniques, which require far less electrical power than traditional digital computing.

The more efficient analog approach would help solve the daunting cooling and cost problems that presently make digital neuromorphic hardware systems impractical.

"To simulate the human brain, the eventual goal would be large-scale neuromorphic systems that could offer a great deal of computational power, robustness and performance," said Jennifer Hasler, a professor in the Georgia Tech School of Electrical and Computer Engineering (ECE), who is a pioneer in using analog techniques for neuromorphic computing. "A configurable analog-digital system can be expected to have a power efficiency improvement of up to 10,000 times compared to an all-digital system."

Hasler and a former student recently published a detailed plan that describes the development of computer systems capable of human-like cognition. The paper, "Finding a Roadmap to Achieve Large Neuromorphic Hardware Systems" by Hasler and Bo Marr, was published in the September 2013 edition of the journal Frontiers in Neuroscience.

"To my knowledge, this is the first time a detailed neuromorphic roadmap has been attempted," said Hasler. "We describe specific computational techniques could offer real progress in neuromorphic systems."

Unlike digital computing, in which computers can address many different applications by processing different software programs, analog circuits have traditionally been hard-wired to address a single application. For example, cell phones use energy-efficient analog circuits for a number of specific functions, including capturing the user's voice, amplifying incoming voice signals, and controlling battery power.

Because analog devices do not have to process binary codes as digital computers do, their performance can be both faster and much less power hungry. Yet traditional analog circuits are limited because they're built for a specific application, such as processing signals or controlling power. They don't have the flexibility of digital devices that can process software, and they're vulnerable to signal disturbance issues, or noise.

In recent years, Hasler has developed a new approach to analog computing, in which silicon-based analog integrated circuits take over many of the functions now performed by familiar digital integrated circuits. These analog chips can be quickly reconfigured to provide a range of processing capabilities, in a manner that resembles conventional digital techniques in some ways.

Over the last several years, Hasler and her research group have developed devices called field programmable analog arrays (FPAA). Like field programmable gate arrays (FPGA), which are digital integrated circuits that are ubiquitous in modern computing, the FPAA can be reconfigured after it's manufactured – hence the phrase "field-programmable."

Hasler and Marr's 29-page paper traces a development process that could lead to the goal of reproducing human-brain complexity. The researchers investigate in detail a number of intermediate steps that would build on one another, helping researchers advance the technology sequentially.

For example, the researchers discuss ways to scale energy efficiency, performance and size in order to eventually achieve large-scale neuromorphic systems. The authors also address how the implementation and the application space of neuromorphic systems can be expected to evolve over time.

"A major concept here is that we have to first build smaller systems capable of a simple representation of one layer of human brain cortex," Hasler said. "When that system has been successfully demonstrated, we can then replicate it in ways that increase its complexity and performance."

Among neuromorphic computing's major hurdles are the communication issues involved in networking integrated circuits in ways that could replicate human cognition. In their paper, Hasler and Marr emphasize local interconnectivity to reduce complexity. Moreover, they argue it's possible to achieve these capabilities via purely silicon-based techniques, without relying on novel devices that are based on other approaches.

Commenting on the recent publication, Alice C. Parker, a professor of electrical engineering at the University of Southern California, said, "Professor Hasler's technology roadmap is the first deep analysis of the prospects for large scale neuromorphic intelligent systems, clearly providing practical guidance for such systems, with a nearer-term perspective than our whole-brain emulation predictions. Her expertise in analog circuits, technology and device models positions her to provide this unique perspective on neuromorphic circuits."

Eugenio Culurciello, an associate professor of biomedical engineering at Purdue University, commented, "I find this paper to be a very accurate description of the field of neuromorphic data processing systems. Hasler's devices provide some of the best performance per unit power I have ever seen and are surely on the roadmap for one of the major technologies of the future."

Said Hasler: "In this study, we conclude that useful neural computation machines based on biological principles – and potentially at the size of the human brain—seems technically within our grasp. We think that it's more a question of gathering the right research teams and finding the funding for research and development than of any insurmountable technical barriers." [9]

Is Your Brain Really a Computer, or Is It a Quantum Orchestra?

Because brain neurons and synapses appear to act like switches and 'bits' in computers, and because brain disorders like depression, Alzheimer's disease and traumatic brain injury ravage humanity with limited effective therapies, scientists, governments and funding agencies have bet big on the brain-as-computer analogy.

For example billions of dollars and euros are being poured into 'brain mapping,' the notion that identifying, and then simulating brain neurons and their synaptic connections can reproduce brain function, e.g. the 'human brain project' in Europe, and the Allen Institute's efforts in Seattle to map the mouse cortex. But the bet, so far at least, isn't paying off.

For example, beginning more modestly, a world-wide consortium has simulated the already-known 302 neuron 'brain' of a simple round worm called C elegans. The biological worm is fairly active, swimming nimbly and purposefully, but the simulated C elegans just lies there, with no functional behavior. Something is missing.

Funding agencies are getting nervous. Bring in the 'P.R. guys.'

In a New York Times piece, 'Face It, Your Brain is a Computer' (June 27, 2015), NYU psychologist/neuroscientist Gary Marcus desperately beats the dead horse.
Following a series of failures by computers to simulate basic brain functions (much less approach 'The C-word', consciousness) Marcus is left to ask, in essence, if the brain isn't a computer, what else could it possibly be?

Actually, the brain is looking more like an orchestra, a multi-scalar vibrational resonance system, than a computer. Brain information patterns repeat over spatiotemporal scales in fractal-like, nested hierarchies of neuronal networks, with resonances and interference beats. One example of a multi-scalar spatial mapping is the 2014 Nobel Prize-winning work (O'Keefe, Moser and Moser) on 'grid cells', hexagonal representations of spatial location arrayed in layers of entorhinal cortex, each layer encoding a different spatial scale. Moving from layer to layer in entorhinal cortex is precisely like zooming in and out in a Google map.

Indeed, neuroscientist Karl Pribram's assessment of the brain as a 'holographic storage device' (which Marcus dismisses) seems now on-target. Holograms encode distributed information as multi-scalar interference of coherent vibrations, e.g. from lasers. Pribram lacked a proper coherent source, a laser in the brain, but evidence now points to structures inside brain neurons called microtubules as sources of laser-like coherence for the brain's vibrational hierarchy.

Microtubules are cylindrical lattice polymers of the protein 'tubuln', major components of the structural cytoskeleton inside cells, and the brain's most prevalent protein. Their lattice structure and self-organization have suggested microtubule information processing, stemming from Charles Sherrington (1951) calling them 'the cell's nervous system'. In the 1980s, my colleagues and I

proposed microtubules acted like computers, specifically as Boolean switching matrices, or molecular automata, processing information, encoding memory, oscillating coherently and regulating neuronal functions from within.

For the past 20 years I've teamed with British physicist Sir Roger Penrose on a quantum theory of consciousness ('orchestrated objective reduction', 'Orch OR') linking microtubule quantum processes to fluctuations in the structure of the universe. Our idea was criticized harshly, as the brain seemed too 'warm, wet and noisy' for apparently delicate quantum coherence. But evidence now clearly shows (1) plant photosynthesis routinely uses quantum coherence in warm sunlight (if a potato can do it....?), and (2) microtubules have quantum resonances in gigahertz, megahertz and kilohertz frequency ranges (the work of Anirban Bandyopadhyay and colleagues at National Institute of Material Science in Tsukuba, Japan).

These coherent 'fractal frequencies' in microtubules apparently couple to even faster, smaller-scale terahertz vibrations among intra-tubulin 'pi electron resonance clouds', and to slower ones, e.g. by interference 'beats' giving rise to larger scale EEG. My colleagues and I (Craddock et al, 2015) have identified a 'quantum underground' inside microtubules where anesthetic gases bind to selectively erase consciousness, dampening and dispersing terahertz dipole vibrations. A multi-scalar, vibrational hierarchy could play key roles in neuronal and brain functions, driven at the 'bottom', inside neurons, by microtubule quantum resonators.

The most likely sites for consciousness are microtubule networks in dendrites and soma of cortical layer 5 giant pyramidal neurons whose apical dendrites give rise to EEG. Dendritic-somatic microtubules are unique, being interrupted and arrayed in mixed polarity networks, unsuited for structural support but optimal for information processing, resonance and interference.

Finally, Marcus raises 2 points, which should be addressed.

Citing conventional wisdom, he concedes 'the brain's nerve cells are too slow and variable to be a good match for the transistors and logic gates that we use in modern computers.

'True! But microtubules inside those nerve cells act at terahertz through gigahertz, megahertz and kilohertz frequencies, and are a very good match, in fact far, far better. [8]

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]

Consciousness as a State of Matter

We examine the hypothesis that consciousness can be understood as a state of matter, "perceptronium", with distinctive information processing abilities. We explore five basic principles that may distinguish conscious matter from other physical systems such as solids, liquids and gases: the information, integration, independence, dynamics and utility principles. If such principles can identify conscious entities, then they can help solve the quantum factorization problem: why do conscious observers like us perceive the particular Hilbert space factorization corresponding to classical space (rather than Fourier space, say), and more generally, why do we perceive the world

around us as a dynamic hierarchy of objects that are strongly integrated and relatively independent? Tensor factorization of matrices is found to play a central role, and our technical results include a theorem about Hamiltonian separability (defined using Hilbert-Schmidt superoperators) being maximized in the energy eigenbasis. Our approach generalizes Giulio Tononi's integrated information framework for neural-network-based consciousness to arbitrary quantum systems, and we find interesting links to error-correcting codes, condensed matter criticality, and the Quantum Darwinism program, as well as an interesting connection between the emergence of consciousness and the emergence of time. [7]

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 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.

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 1/2spin 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.

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 ν frequency. It means that the mass of the proton and electron are electromagnetic and the result of the electromagnetic induction, caused by the changing acceleration of the spinning and moving charge! It could be that the m_o inertial mass is the result of the spin, since this is the only accelerating motion of the electric charge. Since the accelerating motion has different frequency for the electron in the atom and the proton, they masses are different, also as the wavelengths on both sides of the diffraction pattern, giving equal intensity of radiation.

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 Mp=1840 Me. In order to move one of these diffraction maximum (electron or proton) we need to intervene into the diffraction pattern with a force appropriate to the intensity of this diffraction maximum, means its intensity or mass.

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

The 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

Finally, Marcus says 'We need to find a common underlying circuit...logic block that can be configured, and reconfigured...to do a wide range of tasks...highly orchestrated sets of fundamental building blocks,... 'field-programmable gate arrays', ...'computational primitives....the Rosetta stone that unlocks the brain.
I agree completely. And microtubules inside neurons provide exactly, precisely, 100 percent what Marcus is looking for. Viewing neurons as computational primitives is an insult to neurons. Brain mappers should look deeper, smaller, faster, inside neurons. Cytoskeletal circuits of mixed polarity microtubules ('quantum resonators') are key instruments of the quantum orchestra. [8]
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 they 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.

References

[1] The Magnetic field of the Electric current and the Magnetic induction

http://academia.edu/3833335/The_Magnetic_field_of_the_Electric_current

[2] 3 Dimensional String Theory

http://academia.edu/3834454/3_Dimensional_String_Theory

[3] Graviton Production By Two Photon and Electron-Photon Processes In Kaluza-Klein Theories With Large Extra Dimensions

http://arxiv.org/abs/hep-ph/9909392

[4] Quantum Entanglement

http://en.wikipedia.org/wiki/Quantum_entanglement

[5] Quantum Consciousness

https://realitysandwich.com/155783/quantum_consciousness_0/

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

http://www.sciencedaily.com/releases/2014/01/140116085105.htm

[7] Consciousness as a State of Matter

http://arxiv.org/abs/1401.1219

[8] Is Your Brain Really a Computer, or Is It a Quantum Orchestra?

http://www.huffingtonpost.com/stuart-hameroff/is-your-brain-really-a-co_b_7756700.html

[9] Neuromorphic computing 'roadmap' envisions analog path to simulating human brain

http://phys.org/news/2014-04-neuromorphic-roadmap-envisions-analog-path.html

[10] Nanoscale magnetic device mimics behavior of neurons and can recognize human audio signals

https://phys.org/news/2017-07-nanoscale-magnetic-device-mimics-behavior.html